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Review Article

A Comprehensive Review on Medicinal Plant: *Tridax procumbens*

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ABSTRACT

Tridax procumbens (Asteraceae), commonly known as coat button, is a widespread perennial herb extensively used in traditional medicine across tropical and subtropical regions. It has been employed in Ayurveda, Siddha, and folk practices for the treatment of wounds, liver disorders, skin infections, diarrhea, fever, and diabetes. Phytochemical investigations reveal the presence of flavonoids, alkaloids, carotenoids, tannins, and saponins, which contribute to its diverse pharmacological effects. Modern pharmacological studies have validated many of its traditional claims, demonstrating wound healing, anti-inflammatory, antimicrobial, antioxidant, hepatoprotective, antidiabetic, immunomodulatory, and anticancer properties. Despite its therapeutic potential, challenges remain in terms of standardized formulations, detailed mechanistic studies, and clinical validations. This review consolidates the traditional uses, phytochemistry, and pharmacological activities of *T. procumbens* and highlights the gaps that need to be addressed for its future application in modern medicine and drug discovery.

INTRODUCTION

For centuries, medicinal plants have been central to human healthcare, forming the backbone of traditional systems like Ayurveda, Siddha, and folk medicine. Today, as the drawbacks and side effects of synthetic drugs become increasingly apparent, interest in ethnomedicinal plants as safer, more sustainable therapeutic options is steadily growing. One such plant that has captured attention is *Tridax procumbens* (family *Asteraceae*), commonly known as coat button or

“Ghamra” in India. Renowned in various cultures, this humble creeping herb has long been valued for its diverse healing properties. ^[1]



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Native to tropical and subtropical regions of Asia, Africa, and the Americas, *T. procumbens* is widely used in traditional medicine. Folk healers and communities have applied its leaves, flowers, and roots in remedies for wounds, skin infections, liver disorders, diarrhea, cough, fever, and even metabolic conditions such as diabetes. Its broad range of applications reflects both its accessibility and its ethnopharmacological importance. [2]

Scientific studies over the past few decades have supported many of these traditional claims. The plant is rich in phytochemicals—flavonoids, alkaloids, carotenoids, tannins, and saponins—that are linked to a variety of biological effects. Research has shown that *T. procumbens* possesses antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, antidiabetic, and immunomodulatory activities. Early investigations also suggest potential anticancer effects, indicating that this plant could be a promising source of bioactive molecules for modern drug development. [3]

Nevertheless, important challenges remain. Few clinical trials have been conducted, extract

formulations are not standardized, and the precise mechanisms underlying many of its effects are still poorly understood. To unlock its full therapeutic potential, systematic evaluation is needed that integrates traditional wisdom with modern pharmacological research. [4]



This review therefore aims to provide a consolidated overview of the traditional uses, phytochemistry, and pharmacological activities of *Tridax procumbens*. It also highlights the existing knowledge gaps and outlines future perspectives, with the goal of supporting the development of this traditional herb into scientifically validated and clinically relevant therapies. [5]

Table 1. Traditional Uses of *Tridax procumbens* and Corresponding Scientific Validation

Traditional Use	Plant Part Used	Form of Use	Scientific Validation (Pharmacological Activity)	References (examples)
Wound healing, bleeding control (hemostatic)	Leaves, whole plant	Leaf paste, juice applied topically	Accelerates wound contraction, collagen synthesis, and epithelialization	Wound healing studies in rats
Liver disorders (hepatoprotective)	Leaves	Decoction, juice	Protects against CCl ₄ - and paracetamol induced liver damage	Hepatoprotective activity reports
Skin diseases, infections, boils	Leaves, flowers	Topical paste, juice	Antibacterial and antifungal activity against <i>S. aureus</i> , <i>E. coli</i> , <i>Candida</i> spp.	In vitro antimicrobial studies
Fever, malaria	Whole plant, leaves	Decoction, juice	Antipyretic and antiplasmodial effects reported in experimental studies	Ethnobotanical surveys; pharmacological reports

Diabetes, hypertension	Leaves	Aqueous extract	Hypoglycemic, antihyperlipidemic, and antihypertensive activity in animal models	Antidiabetic pharmacology studies
Hair growth promotion	Leaves	Leaf extract, oil preparation	Promotes hair follicle growth and delays hair fall	Animal hair growth studies
Diarrhea, dysentery	Leaves	Decoction, paste	Antidiarrheal activity through reduction of intestinal motility and fluid secretion	Pharmacological validation studies
Cough, respiratory disorders	Whole plant	Decoction	Antitussive and bronchodilatory potential suggested in preliminary studies	Traditional reports, limited scientific validation

Table 2. Major Phytochemicals of *Tridax procumbens* and Their Reported Biological Activities

Phytochemical Class / Compound	Reported Activity	References (examples)
Flavonoids (Quercetin, Luteolin, Catechins)	Antioxidant, antiinflammatory, hepatoprotective, wound healing	Phytochemical and pharmacological studies
Alkaloids	Antimicrobial, analgesic, hypotensive, cytotoxic	Experimental pharmacology
Carotenoids (β -carotene)	Antioxidant, vision protective, immune support	Phytochemical profiling
Tannins	Antimicrobial, antidiarrheal, antioxidant	In vitro antimicrobial assays
Saponins	Immunomodulatory, hypolipidemic, wound healing	Animal models
Glycosides	Cardioprotective, antidiabetic	Pharmacological screening
Sterols (β -sitosterol, stigmasterol)	Anti-inflammatory, cholesterol-lowering, anticancer	Isolated compound studies
Essential oils / Volatile compounds	Antibacterial, antifungal, insecticidal	GC-MS analysis and bioassays
Polysaccharides	Immunomodulatory, wound healing	Extract-based studies

Botanical Description

Tridax procumbens belongs to the family *Asteraceae*, one of the largest families of flowering plants. It is a prostrate, perennial, creeping herb that grows abundantly in tropical and subtropical climates. ^[6]

Taxonomy

- **Kingdom:** Plantae
- **Division:** Angiosperms
- **Class:** Dicotyledonae
- **Order:** Asterales
- **Family:** Asteraceae

- **Genus:** *Tridax*
- **Species:** *Tridax procumbens* ^[7]

Distribution

The plant is widely distributed across Asia, Africa, and Central and South America, thriving in warm and humid regions. In India, it is commonly found along roadsides, fields, and waste lands, where it grows as a weed. ^[8]

Morphological Features



- **Stem:** Slender, hairy, and creeping, capable of rooting at the nodes, which facilitates its rapid spread.
- **Leaves:** Opposite, simple, ovate to lanceolate with serrated (toothed) margins, covered with fine hairs. ^[9]
- **Flowers:** Solitary, daisy-like inflorescences borne on long peduncles; ray florets are white to off-white, while disc florets are bright yellow, giving the flower its distinctive appearance.
- **Fruit:** A small, black, oblong achene with a feathery pappus (hair-like structure) that aids in wind dispersal.
- **Roots:** Fibrous root system. ^[10]



Traditional / Ethnomedicinal Uses of Tridax procumbens

Tridax procumbens has been widely used in Ayurveda, Siddha, folk practices, and tribal medicine across tropical regions. Different parts of the plant, such as leaves, flowers, and roots, are employed in remedies for a variety of ailments. Its ethnomedicinal importance is summarized in the table below. ^[11]

Common Names

- **English:** Coat button, Tridax daisy
- **Hindi:** Ghamra
- **Sanskrit:** Jayanti veda

Table 3. Traditional / Ethnomedicinal Uses of Tridax procumbens

Plant Part Used	Traditional Use	Form of Administration	Reference (Ethnomedicinal Reports)
Leaves	Wound healing, bleeding control (hemostatic)	Leaf paste/juice applied topically on cuts and wounds	Ayurveda, tribal medicine reports
Leaves / Whole plant	Liver disorders, jaundice	Decoction or juice	Folk medicine, Ayurvedic texts
Leaves & Flowers	Skin diseases, boils, leprosy	Leaf/flower paste or extract applied topically	Ethnobotanical surveys
Leaves	Diabetes, hypertension	Aqueous/ ethanolic extract taken orally	Ayurveda, folk practices
Leaves	Hair growth promotion	Leaf extract in oil or paste applied to scalp	Tribal and rural practices
Leaves / Roots	Diarrhea, dysentery	Decoction taken orally	Folk remedies

Phytochemistry of Tridax procumbens

Major Compounds:

- **Flavonoids:** Quercetin, luteolin, catechins

Biological activity: Antioxidant, anti-inflammatory, antimicrobial, wound healing, hepatoprotective.

- **Alkaloids**

Biological activity: Analgesic, antimicrobial, cytotoxic, and anti-diabetic effects. [12]

- **Carotenoids**

Biological activity: Antioxidant, photoprotective, immune-modulatory.

- **Tannins**

Biological activity: Astringent, antimicrobial, hemostatic, anti-diarrheal.

- **Saponins**

Biological activity: Anti-inflammatory, immunomodulatory, hypocholesterolemic, wound healing. [13,14]

- **Glycosides**

Biological activity: Cardioprotective, antioxidant, and anti-inflammatory.

- **Essential oils**

Biological activity: Antimicrobial, anti-inflammatory, insecticidal, and antioxidant. [15]

Pharmacological Activities of Tridax procumbens

Tridax procumbens has been extensively studied for its wide range of pharmacological properties. The plant demonstrates significant wound healing activity, attributed to its ability to accelerate epithelialization, enhance collagen synthesis, and increase wound tensile strength. These effects have been confirmed in various *in vivo* models, suggesting its potential as a natural therapeutic agent for wound management. [16]

The plant also exhibits anti-inflammatory and analgesic effects. Leaf extracts reduce edema in carrageenan-induced inflammation models and

alleviate pain in experimental animals, indicating its role in modulating inflammatory pathways. This activity is largely linked to its rich content of flavonoids, saponins, and alkaloids, which inhibit pro-inflammatory mediators. [17,18]

In addition, *Tridax procumbens* possesses antimicrobial activity. Various extracts, including methanolic and essential oil preparations, show inhibitory effects against a broad spectrum of microorganisms, including bacteria, fungi, and protozoa. The presence of flavonoids, tannins, and essential oils contributes to membrane disruption and microbial growth inhibition. [19]

The plant also demonstrates antioxidant potential, effectively scavenging free radicals in *in vitro* models. Its flavonoid and carotenoid content plays a central role in mitigating oxidative stress, which is crucial for protecting tissues from damage caused by reactive oxygen species. [20,21]

Furthermore, *Tridax procumbens* exhibits hepatoprotective activity. Studies using CCl_4 and paracetamol-induced liver injury models show that extracts of the plant reduce serum liver enzyme levels and restore antioxidant enzyme activities, suggesting protection against hepatotoxicity. [22]

The plant also shows promise in antidiabetic and antihyperlipidemic applications. Experimental studies indicate that leaf extracts improve blood glucose levels, enhance insulin sensitivity, and normalize lipid profiles, possibly through inhibition of carbohydratehydrolyzing enzymes and antioxidant effects. [23]

Moreover, *Tridax procumbens* has immunomodulatory properties, enhancing both humoral and cellular immune responses. Extracts have been reported to stimulate antibody production and activate macrophages, thereby



strengthening the body's defense mechanisms. [24,25]

Lastly, preliminary anticancer studies indicate that methanolic extracts of the plant exhibit cytotoxic effects on cancer cell lines, inducing apoptosis in a dose-dependent manner. Although these studies are primarily in vitro, they highlight the potential of the plant for future anticancer research. [26]

In summary, the diverse pharmacological activities of *Tridax procumbens*—ranging from

wound healing, anti-inflammatory, and antimicrobial effects to antioxidant, hepatoprotective, antidiabetic, immunomodulatory, and anticancer potentials—are largely attributed to its rich phytochemical profile, including flavonoids, alkaloids, saponins, tannins, glycosides, carotenoids, and essential oils. These findings support its traditional use in folk medicine and indicate its potential for therapeutic applications. [27]

Table 4. Pharmacological Activities of *Tridax procumbens*

Pharmacological Activity	Extract/ Compound	Model/Method	Outcome
Wound healing	Aqueous/ methanolic leaf extract	In vivo: Excision & incision wound models (rats)	Accelerated epithelialization, increased collagen content, enhanced tensile strength
Anti-inflammatory & analgesic	Ethanolic leaf extract	In vivo: Carrageenan induced paw edema, acetic acid-induced writhing	Reduced edema and pain; comparable to standard drugs
Antimicrobial	Methanolic/ essential oil extracts	In vitro: Disc diffusion, MIC assays against bacteria (<i>Staph. aureus</i> , <i>E. coli</i>), fungi (<i>Candida</i> spp.), protozoa (<i>Leishmania</i>)	Significant inhibitory activity against bacteria, fungi, protozoa
Antioxidant	Flavonoid-rich fraction	In vitro: DPPH, ABTS, FRAP assays	Strong free radical scavenging activity
Hepatoprotective	Aqueous/ methanolic extract	In vivo: CCl ₄ , paracetamol induced liver injury in rats	Reduced ALT, AST, and liver damage; restored antioxidant enzyme levels
Antidiabetic & antihyperlipidemic	Leaf extract, flavonoids	In vivo: Streptozotocin induced diabetic rats	Decreased blood glucose, improved lipid profile, enhanced insulin sensitivity
Immunomodulatory	Aqueous/methanolic extract	In vivo: Humoral & cellular immunity in mice	Enhanced antibody production and macrophage activity
Anticancer potential	Methanolic extract	In vitro: Cytotoxicity assays on cancer cell lines (HeLa, MCF-7)	Dose-dependent cytotoxicity; induced apoptosis

Toxicity and Safety Profile of *Tridax procumbens*

Tridax procumbens is generally safe when used in traditional medicine, with most studies showing no harmful effects at normal doses. Animal studies

report no significant changes in behavior, body weight, or vital organ functions at therapeutic levels. [28]

However, at very high doses, some caution is needed. Laboratory studies indicate that excessive



amounts of leaf extracts may cause cytotoxicity in certain cell lines and liver stress in animal models, as shown by elevated liver enzymes. [29]

In short, *Tridax procumbens* is considered safe for regular use, but extremely high or prolonged consumption may carry risks, highlighting the need for careful dosing and further safety studies. [30,31]

Tridax procumbens is generally regarded as safe when used in the amounts typically recommended in traditional medicine. Studies in animals have shown that normal doses do not cause noticeable changes in behavior, body weight, or the function of vital organs such as the liver, kidneys, and heart. Blood tests in these studies also revealed no significant alterations in hematological parameters, suggesting that the plant does not adversely affect the blood or immune system at standard doses. [32,33]

However, like many medicinal plants, caution is warranted at very high doses or prolonged use. Experimental studies have reported that extremely large amounts of leaf extracts can sometimes lead to mild liver stress, evidenced by increased liver enzyme levels, and can show cytotoxic effects in certain cell lines. These findings highlight the importance of careful dosing and proper preparation of extracts to ensure safety. [34]

In short, when used responsibly, *Tridax procumbens* is a safe and valuable herb, but excessive consumption or self-medication without guidance could carry risks. Standardized formulations and dosing recommendations are therefore essential for its safe therapeutic application. [35]

Emerging Applications and Potential

In addition to its traditional uses, *Tridax procumbens* is attracting attention for several innovative and modern applications. Researchers are exploring ways to harness its bioactive compounds more effectively, which could expand its role in healthcare and wellness. [36]

1. Nanoformulations: Many of the plant's bioactive compounds, such as flavonoids, saponins, and sterols, have limited solubility or stability when administered directly. By incorporating these compounds into nanoparticles, liposomes, or hydrogels, scientists can improve their bioavailability, stability, and targeted delivery. This approach could make treatments more effective at lower doses, reduce side effects, and allow for controlled release of therapeutic compounds. [37,38]

2. Cosmeceuticals: The hair growth-promoting, skin-protective, and antioxidant properties of *Tridax procumbens* open avenues for its use in the cosmetic industry. Herbal creams, serums, and hair oils derived from leaf extracts could support hair follicle health, reduce hair fall, improve skin texture, and protect against oxidative damage, offering natural alternatives to synthetic cosmetic products. [39,40]

3. Adjunct Therapy in Chronic Diseases: Due to its antioxidant, anti-inflammatory, and immunomodulatory effects, *Tridax procumbens* could serve as a supportive therapy in chronic conditions such as diabetes, cardiovascular disorders, and inflammatory diseases. By reducing oxidative stress and modulating immune responses, it may help enhance the effectiveness of conventional treatments and improve overall patient well-being. [41]

In summary, beyond its role in traditional medicine, *Tridax procumbens* holds significant potential in modern drug delivery, cosmetic



applications, and complementary healthcare, making it a promising candidate for further research and product development. [42,43]

Gaps, Challenges, and Future Directions of *Tridax procumbens*

Although *Tridax procumbens* shows promising pharmacological potential, several challenges remain. Most studies are preclinical, and clinical trials are still lacking, making it difficult to confirm its effectiveness in humans. [44,46]

Another key issue is the standardization of extracts. Different extraction methods and plant sources can lead to variable levels of active compounds, affecting consistency and reliability. [47]

The mechanisms behind its effects—like wound healing, anti-inflammatory, or antidiabetic actions—are not fully understood, highlighting the need for deeper molecular studies. [48]

Looking forward, there is exciting potential for advanced formulations, such as nano-based delivery systems or hydrogels, which could improve the stability, bioavailability, and therapeutic impact of its bioactive compounds. [49,50]

In short, addressing these gaps could turn *Tridax procumbens* from a traditional remedy into a scientifically validated therapeutic agent. [51]

CONCLUSION

Tridax procumbens is a valuable medicinal plant with a long history of traditional use. Modern studies have validated its diverse pharmacological activities, including wound healing, antiinflammatory, antimicrobial, antioxidant, hepatoprotective, antidiabetic, immunomodulatory, and anticancer potentials.

Despite this promising evidence, further research is needed to standardize extracts, clarify mechanisms of action, and conduct clinical trials. Advances in drug delivery and formulation technologies could transform this traditionally used herb into a scientifically validated source of novel therapeutics, bridging traditional knowledge with modern medicine.

Table 5. Abbreviations

Abbreviation	Full Form
AMR	Antimicrobial Resistance
ALT	Alanine Aminotransferase
AST	Aspartate Aminotransferase
CCl ₄	Carbon Tetrachloride
DPPH	2,2-Diphenyl-1-picrylhydrazyl
ABTS	2,2'-Azino-bis(3 ethylbenzothiazoline-6-sulfonic acid)
FRAP	Ferric Reducing Antioxidant Power
GC-MS	Gas Chromatography–Mass Spectrometry
MIC	Minimum Inhibitory Concentration
MCF-7	Michigan Cancer Foundation-7 (breast cancer cell line)
HeLa	Henrietta Lacks cell line (cervical cancer)
STZ	Streptozotocin (used to induce diabetes in animal models)
NP	Nanoformulation / Nanoparticle (context- dependent)
Rx	Prescription / Treatment
Ayurveda	Traditional Indian System of Medicine
Siddha	Traditional South Indian System of Medicine

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