Pharmacological Review of Tridax Procumbens

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Abstract- Tridax procumbens (L.) is a widely distributed medicinal herb belonging to the family Asteraceae and is traditionally used in Ayurveda and folk medicine for its broad therapeutic potential. The plant is rich in bioactive phytochemicals including flavonoids, alkaloids, carotenoids, tannins, saponins, and terpenoids, which contribute to its diverse pharmacological activities. Scientific studies have demonstrated that T. procumbens exhibits significant anti-inflammatory, antimicrobial, antioxidant, wound-healing, hepatoprotective, antidiabetic, and anti-hypertensive properties. Its leaves and aerial parts are particularly noted for strong free radical–scavenging activity and promotion of tissue repair. Additionally, extracts of the plant have shown promising effects against various bacterial and fungal pathogens, supporting its traditional use in treating infections. Despite extensive ethnomedicinal relevance, further research is required to isolate specific active compounds, standardize extracts, and confirm therapeutic efficacy through clinical studies. Overall, Tridax procumbens represents a valuable medicinal resource with potential applications in pharmaceutical and herbal formulations. Tridax procumbens (L.) is a widely distributed medicinal herb belonging to the family Asteraceae and is traditionally used in Ayurveda and folk medicine for its broad therapeutic potential. The plant is rich in bioactive phytochemicals including flavonoids, alkaloids, carotenoids, tannins, saponins, and terpenoids, which contribute to its diverse pharmacological activities. Scientific studies have demonstrated that T. procumbens exhibits significant anti-inflammatory, antimicrobial, antioxidant, wound-healing, hepatoprotective, antidiabetic, and anti-hypertensive properties. Its leaves and aerial parts are particularly noted for strong free radical–scavenging activity and promotion of tissue repair. Additionally, extracts of the plant have shown promising effects against various bacterial and fungal pathogens, supporting its traditional use in treating infections. Despite extensive ethnomedicinal relevance, further research is required to isolate specific active compounds, standardize extracts, and confirm therapeutic efficacy through clinical studies. Overall, Tridax procumbens represents a valuable medicinal resource with potential applications in pharmaceutical and herbal formulations.

Keywords: Tridax procumbens, Pharmacological activities, Anti-inflammatory activity, Wound healing, antimicrobial activity, Antioxidant activity.

I. INTRODUCTION

Tridax procumbens (L.), commonly known as “coat buttons” or “tridax daisy,” is a perennial creeping herb belonging to the family Asteraceae. It is native to tropical and subtropical regions of Central America but has naturalized extensively across Asia, Africa, and India, where it grows abundantly as a roadside and wasteland weed. Despite being widely regarded as an invasive plant, T. procumbens holds significant medicinal value in traditional healing systems, including Ayurveda, Siddha, Unani, and various tribal practices. Local communities have long utilized its leaves, flowers, and roots for treating wounds, fevers, respiratory illnesses, gastrointestinal disorders, and skin infections.

Phytochemical investigations have revealed that T. procumbens contains a rich spectrum of secondary metabolites such as flavonoids, alkaloids, carotenoids, saponins, tannins, β-sitosterol, and various terpenoids. These compounds are responsible for the plant’s diverse pharmacological properties, including anti-inflammatory, antioxidant, antimicrobial, hepatoprotective, immunomodulatory, antidiabetic, and wound-healing activities. The presence of high flavonoid content, particularly quercetin and luteolin derivatives, has attracted significant scientific interest due to their potent free-radical scavenging and cytoprotective effects. In recent decades, growing evidence from in vitro, in vivo, and preliminary clinical studies has supported many of the traditional claims associated with T.

procumbens. However, most available research remains fragmented, with variations in extraction methods, phytochemical profiling techniques, and experimental designs. Comprehensive reviews are therefore essential to consolidate current knowledge, evaluate pharmacological relevance, and identify research gaps. Understanding the phytoconstituents, mechanisms of action, and therapeutic potential of T. procumbens will aid in the development of standardized herbal formulations and may open avenues for novel drug leads.

Medicinal plants have served as the foundation of traditional healthcare systems across the world for centuries. In recent years, there has been a renewed scientific interest in herbal medicines due to their perceived safety, affordability, and wide therapeutic potential. Among these plants, Tridax procumbens Linn., belonging to the family Asteraceae, has emerged as a plant of considerable pharmacological importance. Commonly known as coat buttons or tridax daisy, the plant is widely distributed in tropical and subtropical regions and is often considered a weed. Despite its common occurrence, Tridax procumbens has been extensively used in folk medicine for treating wounds, cuts, inflammation, diarrhea, liver disorders, and skin infections.

The increasing interest in plant-based therapeutics has encouraged researchers to scientifically validate the traditional claims associated with Tridax procumbens. Various experimental studies have revealed that the plant possesses multiple pharmacological activities, including anti-inflammatory, wound healing, antimicrobial, antioxidant, antidiabetic, hepatoprotective, and immunomodulatory effects. These activities are primarily attributed to the presence of diverse phytochemical constituents.

II. BOTANICAL DESCRIPTION

Tridax procumbens is a prostrate, hairy herb with elongated stems that root at the nodes. The leaves are simple, ovate, and serrated, while the flowers are yellow-cantered with white ray florets. The whole plant, including leaves, stems, and flowers, is used for medicinal purposes.

Tridax procumbens Linn., belonging to the family Asteraceae, is a perennial creeping herb with hairy prostrate stems that root at the nodes. Leaves are opposite, ovate-lanceolate with serrated margins. The plant is widely distributed in tropical and subtropical regions and is commonly used in traditional medicine for wound healing, anti-inflammatory, and antimicrobial purposes. The plant is characterized by elongated, branched stems that grow close to the ground and root at the nodes. The stems are covered with fine hairs, giving the plant a slightly rough texture. The leaves are simple, opposite, ovate to lanceolate in shape, with serrated margins and a hairy surface. They are dark green in colour and borne on short petioles. The flowers are solitary capitula, borne on long peduncles, with a yellow tubular disc floret at the centre surrounded by white or pale-yellow ray florets. Flowering occurs throughout the year, especially during warmer seasons. The fruit is a hard achene, crowned with a feathery pappus that aids in wind dispersal. Tridax procumbens is widely distributed in tropical and subtropical regions and commonly grows along roadsides, wastelands, and cultivated fields. Various parts of the plant, particularly the leaves and whole aerial portions, are used for medicinal and pharmacological purposes.

III. PLANT HABIT & STEM

Habit: An annual or sometimes perennial, straggling herb, growing prostrate (flat) or ascending.
Stem: Hairy, branched, green or purplish, and brittle.

Leaves
Arrangement: Simple, opposite.
Shape: Ovate to elliptic, with acute (pointed) tips.
Margin: Deeply toothed or incisor-dentate.
Texture: Covered in stiff, white hairs (strigose) and sometimes glandular.

Inflorescence (Flowers)
Type: Solitary, daisy-like flower heads (capitula) on long stalks (peduncles).

Florets: Central disc of numerous yellow, tubular florets surrounded by 4-7 pale-yellow or white, strap-shaped ray florets.

Fruit
Type: Achene (cypsela).
Appearance: Oblong, dark, covered in fine silky hairs.
Pappus: A prominent, feathery, plume-like tuft of white bristles that aids wind dispersal.

Habitat & Significance
A widespread and aggressive weed in fields, lawns, roadsides, and disturbed lands.
Known for prolific seed production, with each plant producing many wind-dispersed fruits.

IV. PHYTOCHEMICAL CONSTITUENTS

Phytochemical screening of Tridax procumbens reveals the presence of several biologically active compounds:

- Flavonoids (quercetin, luteolin derivatives)
- Alkaloids
- Carotenoids
- Tannins and phenolic compounds
- Sterols and saponins

Flavonoids and phenolic compounds are primarily responsible for antioxidant and anti-inflammatory actions, while alkaloids and tannins contribute to antimicrobial and wound-healing activities. The combined effect of these constituents leads to a broad pharmacological profile.

V. PHARMACOLOGICAL ACTIVITIES

Anti-Inflammatory Activity:
Experimental studies have demonstrated that T. procumbens extracts significantly reduce inflammation in animal models. The mechanism involves inhibition of inflammatory mediators such as prostaglandins and cytokines. The plant also stabilizes lysosomal membranes, thereby preventing the release of inflammatory enzymes. These properties justify its traditional use in treating swelling, arthritis, and inflammatory pain.

Analgesic Activity:
The analgesic effect of Tridax procumbens is closely associated with its anti-inflammatory action. The plant extract reduces pain perception by modulating peripheral nociceptors and inhibiting inflammatory pain pathways. This makes it beneficial in managing mild to moderate pain conditions.

Wound-Healing Activity:
One of the most well-documented pharmacological effects of Tridax procumbens is its wound-healing potential. Topical application of plant extracts accelerates wound contraction, increases collagen formation, and promotes faster epithelialization. The presence of antioxidants protects newly formed tissues from oxidative damage, while antimicrobial activity prevents secondary infections.

Antimicrobial Activity:
Tridax procumbens exhibits significant antibacterial and antifungal activity against a wide range of pathogenic microorganisms. The antimicrobial effect is attributed to phytochemicals that disrupt microbial cell walls, interfere with protein synthesis, and inhibit essential metabolic enzymes. This activity supports its use in treating skin infections and wounds.

Antioxidant Activity:
Oxidative stress is a major contributor to chronic diseases such as cancer, diabetes, and cardiovascular disorders. T. procumbens possesses strong antioxidant properties due to its high phenolic and flavonoid content. The plant effectively scavenges free radicals and enhances endogenous antioxidant defence mechanisms, thereby protecting cells from oxidative damage.

Hepatoprotective Activity:
Studies have shown that Tridax procumbens offers protection against chemically induced liver damage. The plant extract normalizes elevated liver enzyme levels and improves liver histology. The hepatoprotective effect is primarily due to its antioxidant and anti-inflammatory properties, which reduce hepatic oxidative stress and inflammation.

Antidiabetic Activity:
Preclinical investigations indicate that Tridax procumbens possesses antidiabetic activity by improving glucose utilization and enhancing insulin sensitivity. The plant helps in reducing blood glucose levels and prevents diabetes-associated complications, suggesting its potential role in managing metabolic disorders.

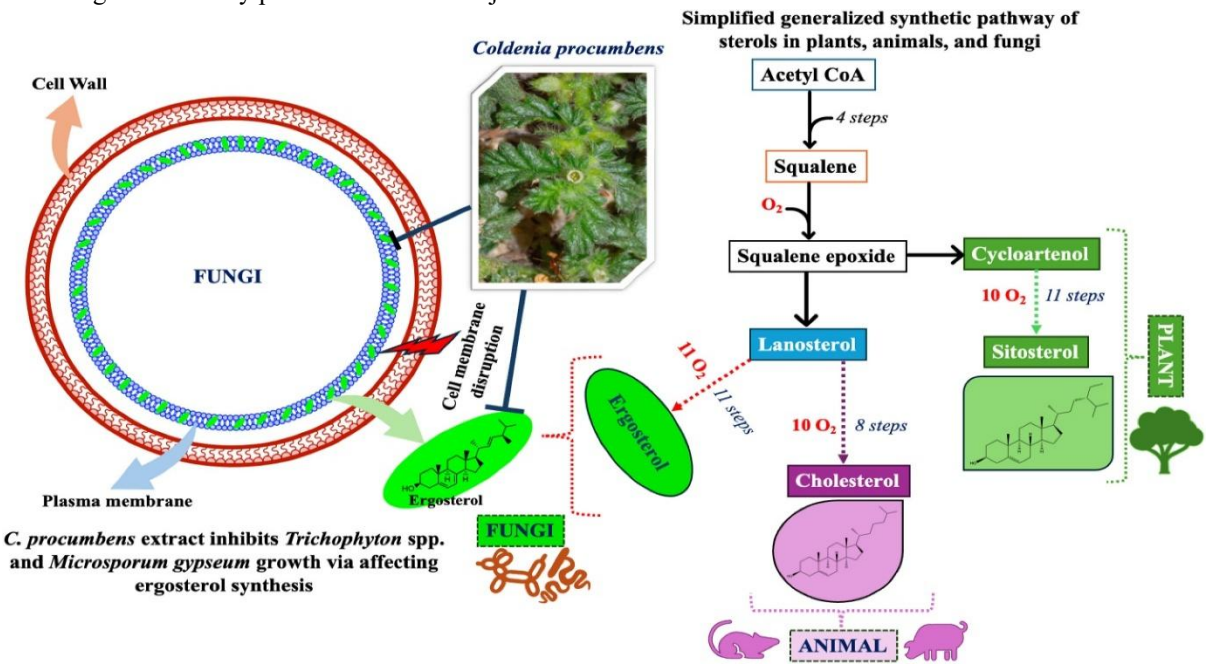
Cardiovascular and Antihyperlipidemic Effects:
The plant has been reported to reduce serum cholesterol and triglyceride levels. By improving lipid metabolism and reducing oxidative stress, Tridax procumbens may lower the risk of atherosclerosis and cardiovascular diseases.

Future Perspectives
Despite extensive pharmacological evidence, the clinical application of Tridax procumbens remains limited. Future research should focus on:

- Isolation and characterization of active compounds
- Molecular mechanism studies
- Standardization of extracts
- Clinical trials to establish efficacy and safety
- Standardization of dosage forms.
- Molecular docking studies to understand the interaction of T. procumbens alkaloids with cancer cell receptors.
- Long-term toxicity profiles in human subjects.

Traditional Uses of Tridax procumbens Linn.
Tridax procumbens Linn. has a long history of use in traditional medicine systems across tropical and subtropical regions. The plant has been traditionally employed for:

- Wound healing: Leaves are crushed and applied to cuts, wounds, and burns to accelerate healing.
- Anti-inflammatory purposes: Used to reduce swelling and treat insect bites.
- Antimicrobial activity: Employed to prevent infection in minor injuries.
- Gastrointestinal disorders: Leaf decoctions are used to treat diarrhea and dysentery.
- Respiratory ailments: Traditionally used to relieve coughs and colds.
- Fever and headache: Crushed leaves or decoctions are applied to alleviate fever and headaches.
- Hair care: Extracts are used in some cultures to promote hair growth and reduce hair fall.



VI. CONCLUSION

Tridax procumbens Linn., commonly known as "coat buttons," is a perennial creeping herb of the family Asteraceae that holds immense potential in modern pharmacology due to its diverse therapeutic properties. Traditionally regarded as a weed, this plant has been extensively utilized in folk medicine across tropical and subtropical regions for the management of wounds, inflammation, gastrointestinal disorders, respiratory ailments, fever, and other minor health conditions. Scientific studies over the past decades have validated many of these ethnomedicinal claims, confirming that the plant possesses significant pharmacological activities such as wound healing, anti-inflammatory, antimicrobial, antioxidant, hepatoprotective, antidiabetic, and cardioprotective effects.
Phytochemical investigations have revealed that Tridax procumbens contains a wide array of bioactive constituents, including flavonoids, alkaloids, tannins, phenolic compounds, sterols,

saponins, and carotenoids. These constituents are responsible for the observed pharmacological effects, acting through multiple biochemical pathways and molecular mechanisms. For instance, flavonoids and phenolic compounds contribute to its strong antioxidant and anti-inflammatory activities, while sterols and saponins play a role in wound healing and hepatoprotective effects. The synergy between these phytochemicals underscores the therapeutic potential of the whole plant and provides a scientific rationale for its traditional uses.

Toxicological studies suggest that Tridax procumbens is relatively safe at therapeutic doses, with minimal adverse effects reported in experimental models. Nevertheless, comprehensive studies on long-term toxicity, dosage optimization, and clinical safety are still lacking, which is crucial for translating its pharmacological potential into safe and effective herbal formulations. Additionally, despite significant experimental evidence supporting its pharmacological efficacy, clinical trials on human subjects remain limited. Bridging this gap through well-designed preclinical and clinical studies is essential to establish standardized protocols for its use in modern medicine.

The future prospects of Tridax procumbens are promising. Continued research should focus on the isolation and characterization of its bioactive compounds, elucidation of their precise mechanisms of action, and standardization of extracts for quality, potency, and safety. Moreover, the development of novel phytopharmaceuticals, herbal formulations, and nutraceuticals based on Tridax procumbens could provide cost-effective and accessible therapeutic options, particularly in regions where conventional medicine is limited. Integrating modern pharmacological research with traditional knowledge can facilitate the development of multi-targeted therapeutic agents from this plant, potentially addressing various health challenges, including chronic wounds, inflammatory conditions, oxidative stress-related disorders, and metabolic diseases.

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