IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

Tridax Procumbens : Promising Phytopharmaceutical Agent for Wound Healing and Skin Regeneration

Prof. Khandre R. A[1]. Dr. Abhishek Kumar Sen[2]., Miss. Bhand Vishakha Keshav[3]
Mr. Bhagawat Mahesh Sunil[4]
[1]Professor, [2]Principal, [3]Student
Pratibhatai Pawar College of Pharmacy, Shrirampur, Ahilyanagar, Maharashtra, India

Abstract: *Coat buttons or Tridax procumbens Linn., are a well-known medicinal herb for its potent wound-healing and skin-regenerating qualities. Packed with bioactive substances including flavonoids, alkaloids, tannins, and saponins, it has antibacterial, anti-inflammatory, antioxidant, and immunomodulatory properties that work together to improve tissue healing. The pharmacological, phytochemical, and mechanistic aspects of T. procumbens in wound healing are thoroughly examined in this review, which also describes its function in the four stages of wound healing: hemostasis, inflammation, proliferation, and remodeling. With encouraging results in both in vitro and in vivo models, preclinical research shows its effectiveness in stimulating fibroblast proliferation, collagen synthesis, angiogenesis, and epithelialization. Its conventional use in various cultures, extraction techniques, and formulation approaches such bioactive wound dressings are also covered. Despite its medicinal potential, issues such phytochemical content fluctuation, dose-dependent inflammation, and a lack of clinical trials call for more research. For contemporary wound care and skin regeneration treatments, T. procumbens appears to be a safe, economical, and promising phytopharmaceutical agent*

Keywords: Tridax procumbens ,Coatbuttons, Epithelialization, Cytotoxicity, Angiogenesi

I. INTRODUCTION

Tridax procumbens: A Natural Wonder for Wound Healing .Tridax procumbens, commonly known as coatbuttons or tridax daisy, is a well-recognized medicinal herb celebrated for its remarkable wound-healing potential. Traditionally employed in various indigenous medical systems, this plant has gained scientific attention for its ability to accelerate wound recoveryand promote tissue regeneration. Rich in bioactive constituents such as flavonoids, alkaloids, and tannins, T. procumbens demonstrates potent antimicrobial, anti-inflammatory, and antioxidant activities—key factors contributing to its therapeutic efficacy. Contemporary studies have revealed that extracts from T. procumbens stimulate fibroblast proliferation, enhance collagen synthesis, and promote angiogenesis, thereby facilitating faster wound contraction and epithelialization while minimizing infection risk. Moreover, its antiinflammatory action helps relieve pain and edema at the wound site, and its antioxidant properties protect tissues from oxidative stress, ensuring optimal healing. Whether formulated into topical creams, ointments, or bioactive dressings, Tridax procumbens represents a natural, safe, and sustainable alternative for modern wound management and skin regeneration therapies.(1)

DOI: 10.48175/IJARSCT-31954

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

Figure 1: TRIDAX PROCUMBENS LINN

Wounds may result from accidental injuries, surgical procedures, or various medical conditions. They are often accompanied by pain, inflammation, and loss of function, which can significantly impact a patient's quality of life and increase healthcare costs.(2) Wounds are generally categorized into two types: acute and chronic. Wound healing is a complex biological process involving the restoration of damaged tissues and the replacement of dysfunctional cellular structures.(3) Acute wounds typically follow a well-defined sequence of healing stages, showing visible signs of recovery within four weeks. In contrast, chronic wounds fail to progress through the normal phases of healing and do not exhibit improvement within the same period. The overall healing process is influenced by several factors, including the condition of the wound site, systemic mediators, type of injury, and underlying health disorders. Common treatment approaches include physical closure of the wound edges using sutures and dressings. In cases where closure is not feasible, wounds are left open to allow natural cleansing and filling with connective tissue, facilitating sequential tissue repair.

Natural compounds have been utilized for centuries in the treatment of wounds, with many derived from plants and animals that serve as abundant and accessible sources for wound care. Their effectiveness has been well documented in traditional medicinal systems such as Chinese and Indian medicine. Given the vast diversity of natural compounds, systematic reviews are essential to help researchers and readers identify promising bioactive agents and develop innovative wound-healing formulations. Several previous studies have explored natural compounds for wound management. For instance, Ryall et al. examined recent advancements in skin delivery of bioactive natural agents like turmeric, green tea, honey, garlic, and aloe vera.(4) Vitale et al. investigated the phytochemistry and biological activities of medicinal plants involved in wound repair, while Ataide and colleagues discussed the wound-healing activities and mechanisms of various bioactive compounds. (5)Similarly, Dumitru et al. reviewed bee-derived products, and Fana et al. explored traditional Iranian medicine for natural wound-healing agents. Although these reviews provided extensive lists and classifications of natural compounds based on their categories, bioactivities, and mechanisms of action, they often lacked detailed discussion regarding the specific phases of wound healing influenced by each compound. Consequently, readers may find it challenging to locate information linking compounds to particular healing stages, chemical structures, or detailed mechanisms of action. The process of wound healing Involves four sequential and overlapping phases: hemostasis, inflammation, proliferation, and remodeling. An illustration depicting these stages of wound healing is shown in Figure .2

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

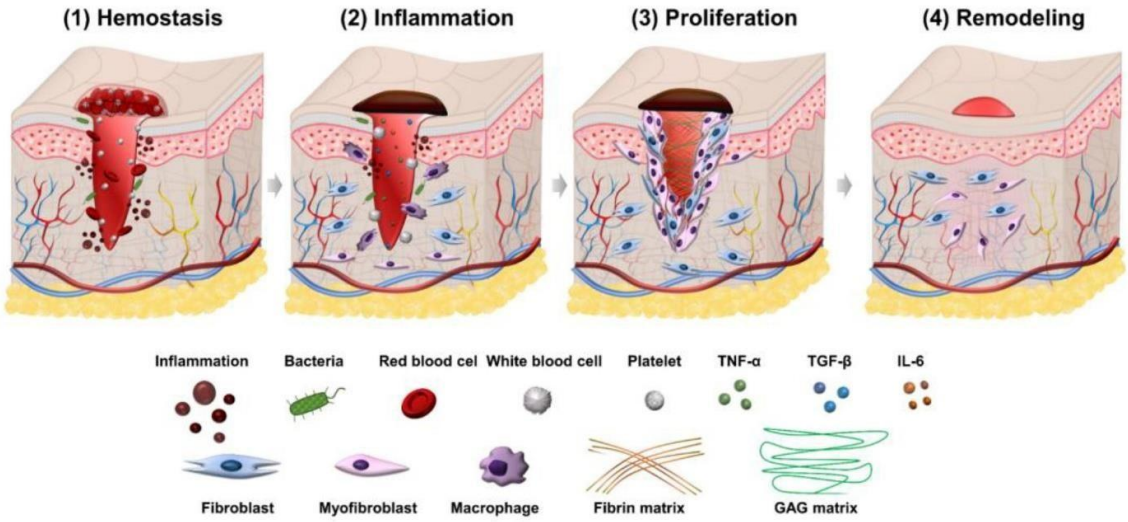

Figure 2: Illustration of four phases in the wound healing process

1. Hemostasis Phase:-

Wound healing begins with the hemostasis phase. During this stage, injury to lymphatic vessels causes blood to flow out, helping to remove microorganisms and antigens. The body then activates a series of clotting cascades, leading to the aggregation of thrombocytes in response to exposed collagen. Simultaneously, platelets trigger vasoconstriction to minimize blood loss and promote the formation of a clot that fills tissue gaps. This clot contains cytokines and growth factors essential for initiating the healing process. It is composed of fibrin, fibronectin, vitronectin, and thrombospondin, which together form a temporary matrix that serves as a scaffold for the migration of leukocytes, keratinocytes, fibroblasts, and endothelial cells. Additionally, this matrix acts as a reservoir for growth factors, helping to stabilize the clot and prevent further bleeding. (6)

2. Inflammation Phase:-

The second phase of wound healing Is the inflammatory phase, which is primarily responsible for cleansing the wound and preparing it for new tissue formation. This stage is characterized by the infiltration of neutrophils and typically lasts for about 2–5 days following injury. Neutrophils play a crucial role by phagocytizing pathogens and releasing proteolytic enzymes such as elastase, cathepsin G, and proteinase 3, which help eliminate bacteria and remove cellular debris. Additionally, they secrete inflammatory mediators, including TNF-α, IL-1, and IL-6, which enhance the inflammatory response and stimulate the production of VEGF and IL-8 to support tissue repair. As the process progresses, macrophages take over by continuing phagocytosis of debris and releasing growth factors, chemokines, and cytokines that promote cell proliferation and tissue regeneration. Macrophages are essential in regulating inflammation, clearing apoptotic cells, and facilitating tissue recovery. Common signs observed during this phase include edema, redness (erythema), and pain.(7)

3. Proliferation Phase:-

The proliferation phase is one of the most crucial stages of the wound-healing process, typically lasting from 6 to 21 days. During this phase, the wound site is repaired through the synthesis of new collagen and extracellular matrix (ECM) components, which facilitate the development of new tissue. As healing progresses, the wound gradually contracts due to tissue formation and remodeling. The establishment of new blood vessels, known as angiogenesis, is essential for sustaining granulation tissue by ensuring an adequate supply of oxygen and nutrients. Fibroblasts differentiate into myofibroblasts during this phase, contributing to granulation tissue formation. (8) Myofibroblasts are specialized cells capable of generating contractile forces and producing ECM components that enable wound

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

contraction. By attaching to the wound edges and pulling them together, myofibroblasts function similarly to smooth muscle cells to close the wound. In the early stages, granulation tissue appears pink or red with a moist, uneven texture, indicating healthy tissue formation that resists further clotting.(9)

Dark-colored granulation tissue may indicate infection, ischemia, or inadequate blood perfusion. Toward the end of the proliferation phase, epithelial cells begin to resurface the wound, a process known as epithelialization. Maintaining a moist wound environment accelerates this process, which is why occlusive or semi-occlusive dressings applied within 48 hours of injury are beneficial—they help preserve optimal tissue humidity. One of the key outcomes of the proliferation phase is the replacement of the temporary fibrin matrix with a new matrix composed of collagen fibers, proteoglycans, and fibronectin, thereby restoring the tissue's structural integrity and function. Another vital event during this phase is angiogenesis, the formation of new capillaries to replace damaged ones and reestablish blood circulation. The formation of granulation tissue and the epithelialization of the wound surface are critical features of this stage.(10)

Fibroblasts are the most essential cells in the proliferation phase. For these cells to migrate within the extracellular matrix (ECM), they must recognize and bind to specific matrix components. While fibroblasts in normal dermal tissue are typically inactive and sparsely distributed, they become highly active and abundant within the provisional matrix and granulation tissue of a wound. Their migration and accumulation at the wound site require morphological adaptations and the secretion of proteolytic enzymes to clear a path through the ECM. The direction of fibroblast movement is guided by gradients of chemotactic growth factors, cytokines, and chemokines, as well as the alignment of fibrils in the ECM and provisional matrix. Rather than crossing these fibrils, fibroblasts tend to migrate along their aligned structures.(11)

To facilitate their movement through the extracellular matrix (ECM), fibroblasts locally secrete proteolytic enzymes. Among these are matrix metalloproteinases (MMPs), including collagenase (MMP-1), gelatinases (MMP-2 and MMP-9), which degrade gelatin substrates, and stromelysin (MMP-3), which acts on various ECM protein components. Once fibroblasts migrate into the matrix, they undergo morphological changes, become stationary, and begin to proliferate while synthesizing key granulation tissue components such as collagen, elastin, and proteoglycans. These fibroblasts attach to the provisional fibrin matrix fibers and initiate collagen production. Initially, large amounts of type III collagen, along with other extracellular matrix proteins and proteoglycans, are synthesized. Collagen mRNA associates with polyribosomes on the rough endoplasmic reticulum, where new collagen chains are assembled following transcription and processing. A critical step in collagen biosynthesis involves the hydroxylation of proline and lysine residues, which is essential for the proper stability and structural integrity of the collagen fibers.(12)

4.Remodeling Phase:-

In clinical settings, the remodeling or maturation phase of wound healing can continue for several months or even years. (13)This final stage determines the ultimate outcome of the wound—whether a scar will form and whether the wound is likely to recur. The remodeling phase involves regression of newly formed blood vessels, periodic deposition and reorganization of extracellular matrix (ECM) components, and the transformation of granulation tissue into mature scar tissue.(14) Initially, granulation tissue is primarily composed of type III collagen, which is progressively replaced by the stronger type I collagen through a coordinated process of collagen I synthesis and collagen III degradation, accompanied by ECM remodeling.

During this phase, scar tissue gradually develops and strengthens, with the overall duration depending on factors such as wound severity, location, and the treatment methods used. As the new tissue matures, it becomes more resilient and flexible due to ongoing collagen synthesis, which enhances the skin's tensile strength and elasticity. Following reepithelialization, macrophages revert to their phagocytic phenotype, particularly the Mreg and M2c-like subtypes, which help remove excess cells and matrix components that are no longer needed for tissue repair(15)

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

ADVANTAGES

1. Accelerates Wound Healing:

Topical formulations of Tridax procumbens stimulate collagen synthesis and fibroblast proliferation, essential for tissue repair and wound contraction, leading to faster healing comparable to standard VEGF treatment .

2. Dose-dependent Effect:

The plant exhibits dose-dependent healing activity; low doses promote repair, increase neovascularization, and improve wound remodeling, whereas higher doses may cause inflammation, emphasizing proper dosing for therapeutic use .

3. Antimicrobial and Anti-inflammatory:

Bioactive compounds such as flavonoids, alkaloids, tannins, and saponins provide antimicrobial and anti-inflammatory effects that prevent infection and reduce inflammation at wound sites, thereby enhancing healing efficacy .

4. Promotes Scarless Healing:

The serine protease procumbenase isolated from T. procumbens enhances epithelialization and wound contraction, contributing to scar-free healing with improved tensile strength in animal models .

5. Antioxidant Protection:

The antioxidant properties of the plant protect wound tissue from oxidative stressinduced cell damage, supporting a healthier wound environment.

6. Supports Skin Regeneration and Granulation:

Tridax procumbens extracts promote granulation tissue formation and angiogenesis, which are critical for sustained nutrient and oxygen supply necessary for tissue regeneration .

7. Safe and Cost-effective:

Being a natural, traditionally used herb, it offers a safer, affordable alternative or complementary therapy to synthetic chemical wound healing agents, especially beneficial in resource-limited settings.(1)

DISADVANTAGES

1.Dose-dependent Inflammatory Response:

Higher doses of Tridax procumbens topical formulations can induce inflammation, tissue edema, and decreased vascularity at the wound site, which may delay healing or cause antihealing effects.

2.Potential for Toxicity at High Concentrations:

While low doses promote healing, excessive application might lead to tissue irritation or cytotoxic effects, though detailed toxicity profiles and long-term safety are still under investigation.

3.Lack of Extensive Clinical Trials:

Most evidence comes from preclinical animal studies, and there remains a scarcity of largescale human clinical trials to thoroughly establish safety, efficacy, and potential side effects in diverse populations .

4.Variability in Phytochemical Content:

Differences in plant sourcing, preparation, and extraction methods may cause inconsistent phytochemical profiles, affecting therapeutic potency and reproducibility of effect .

5.Possible Allergic Reactions:

Some individuals may have hypersensitivity or allergic reactions to plant constituents, though data on such adverse immunological responses to Tridax procumbens is limited and warrants caution.

LITERATURE REVIEW

1.Wankhade S.S. (2023):-

The ethanolic extract of Tridax procumbens has been shown to boost wound contraction, Accelerate cell migration, and stimulate collagen production, leading to faster epithelization and overall wound closure, all while exhibiting very low cytotoxicity.(41)

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

2. Martin P. (2023):-
The plant's wound-healing potential is largely attributed to its anti-inflammatory, antimicrobial, antioxidant, and collagen-enhancing properties, all of which have been validated through both in vitro and in vivo research.(42)
3. Vitale S., Colanero S., Placidi M., Di Emidio (2023):-
The T. Procumbens–CMC film Promoted 95–98% L929 fibroblast proliferation and accelerated wound healing in mice within 10 days. Histological analysis showed increased fibroblasts and collagen, indicating its strong potential as an effective wound-dressing material. (32)
4.Chaudhari, H.C. & Pati, K.P. (2010):-
Shown to significantly improve wound healing by boosting cell migration, supporting epithelization and collagen viability, and remaining non-cytotoxic, highlighting its value as a natural therapeutic agent.(30)
5.Yaduvanshi, B., Mathur, R., Mathur, S.R., Velpandian (Year not specified):-
A systematic review reports that Tridax supports multiple wound-healing stages by enhancing fibroblast growth, mucopolysaccharide formation, collagen production, and fiber crosslinking.
6.Bhagwat,D.A.,Killedar, S.G. and Adnaik, R.S. (2025):-
Tridax procumbens has strong wound-healing effects due to its rich phytochemicals like flavonoids, alkaloids, and tannins. Its anti-inflammatory and antimicrobial actions further support faster wound repair and tissue regeneration.
7.Tripathi,N.,Makode, D.,Jawade,V.,Verma,M., Kanwar, J.R., (2024):-
Studies and experimental data show that Tridax procumbens speeds up healing by boosting fibroblast growth, enhancing collagen production, and reducing inflammation. It is increasingly recognized as an effective herbal option in modern wound management.
8.Gavhane, A., Bhagwat, A., Kale, A., Garje, S., Sayyad, G.(2022):-
Animal studies show that a 5% w/w Tridax procumbens ointment effectively boosts wound contraction and collagen formation, with the best results seen in non-diabetic groups.
9.Amutha, R., (2025):-
Early studies on Tridax procumbens gel show it supports tissue repair and helps prevent infections because of its antimicrobial compounds. Further research is needed to confirm its effectiveness in clinical use.
10.Chen, H., Li, G., Liu, Y., Ji, S., Li, Y., Xiang, J., Zhou, L., Gao, H., Zhang, W., Sun, X.(2023):-
A CMC film loaded with T. Procumbens extract showed strong cell growth and quick wound healing in mice within 10 days. Histology confirmed increased fibroblast activity, higher collagen deposition, and antibacterial effects. The gel proved highly biocompatible and effective as a wound-dressing material.

BOTANICAL PROFILE:-
Taxonomical Classification: (16)
Classification
Divisions Classing
Kingdom Plantae -Plants
Sub kingdom Tracheobionta–Vascular plants
Division Spermatophyta
Subdivision Magnoliphyta-Flowering plants
Class Magnoliopsida–Dicotyledons
Subclass Asteradae
Classification
Divisions Classing
Order Asterales
Family Asteraceae–Aster family
Genus Tridax L.–Tridax

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

Species Tridax procumbens L.–Coat buttons

Table No 1: Taxonomical Classification of Tridax Procumbens Linn.

Chrysanthemum procumbens
Balbisia canescens
Balbisia divericata
Balbisia peduncalata
Tridax procumbens var. Canescenes
Tridax procumbens var. ovatifolia(17)

Table No 2: Synonyms of Tridax Procumbens Linn

English	Coat Buttons and Tridax Daisy
Hindi	Ghamra
Sanskrit	Jayanti Veda
Marathi	Dagadi Pala
Telugu	Gaddi Chemanthi
Tamil	Thata poodu
Malayalam	Chiravanak
Spanish	Cadilp Chisaca
French	Herbe Caille
Chinese	Kotobukigiku (18)

Table No 3: Vernacular names of Tridax Procumbens Linn.

MORPHOLOGY

The semi-prostrate annual herb Tridax procumbens possesses slender stems that grow 30–50 cm in height, are sparsely hairy, and root at the nodes. The leaves are opposite, exstipulate, and range from lanceolate to ovate in shape, measuring approximately 3–7 cm in length. They have an obtuse apex, irregularly serrated margins with a wedge-shaped base, short petioles, and are hairy on both surfaces. The leaf lamina exhibits distinct adaxial and abaxial faces, each covered by a thick cuticle over a single-layered epidermis. The upper epidermis bears multicellular covering trichomes, while the lower epidermis consists of elongated, compactly arranged cells.

Calcium oxalate crystals are present within the xylem vessels, and the vascular bundles display a concentric arrangement. The meristele comprises a single accessory vascular bundle surrounded by parenchymatous cells. The plant produces bright yellow, tubular flowers arranged in capitulum inflorescences, characteristic of the Asteraceae family. Each capitulum contains two types of florets: central disc florets with basal placentation and peripheral ray florets.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

The fruit Is an achene that is hard, ribbed, and covered with stiff hairs, bearing a feathery white pappus at one end that facilitates wind dispersal. The flowering heads are borne on long peduncles, sometimes reaching up to 60 cm in height. The ray florets are pale yellow, ligulate, and trifid at the apex, while the disc florets are bisexual and tubular.

Seed germination occurs optimally under 58–78% light intensity and warm temperatures ranging from 30/20 °C to 35/25 °C. However, germination is highly sensitive to salinity and water stress. T. procumbens exhibits a chromosome number of n = 18 and 2n = 36. Propagation occurs both sexually through seeds and vegetatively through the rooting of stem nodes.(19)

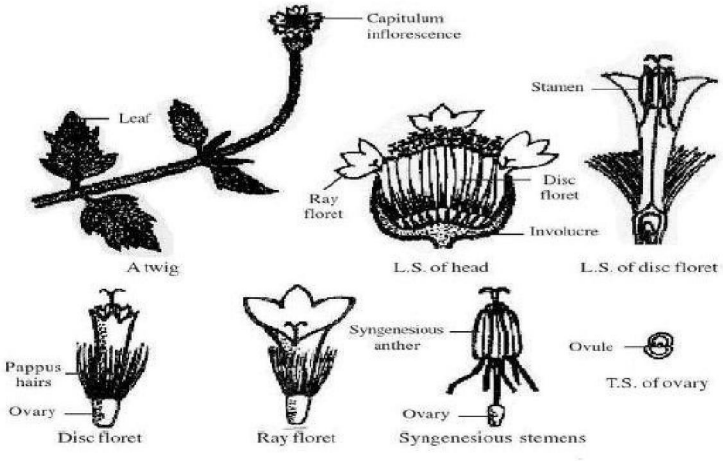

Figure 3. Macroscopic Character Of Leaf, Flower,Stem and Root

PHYTOCHEMICAL COMPOSITION :- (23)

Phytochemical Group	Representative Compounds	Medicinal Actions	Role in Wound Healing
Flavonoids	Luteolin, Quercetin, Isoquercetin, Catechins	Antioxidant, Antiinflammatory, Antimicrobial	Reduce inflammation, neutralize free radicals
Tannins	Tannic Acid, Hydroxycinnamates	Astringent, Antimicrobial	Promote tissue contraction, hemostasis,
			prevent infection
Alkaloids	Akuammidine, Voacangine, Echitamine, Lupanine	Antimicrobial, Antiinflammatory	Inhibit microbial growth, enhance tissue defense
Saponins	-	Antimicrobial, Immunemodulating	Protect wound from bacterial infection
Carotenoids	Lutein, Carotene, Antheraxanthin, Neoxanthin	Antioxidant	Scavenge reactive oxygen species, protect

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

			tissue
Phytosterols	β-sitosterol, Stigmasterol	Antiinflammatory, Membrane stabilizer	Support skin regeneration, reduce swelling
Other Bioactives	Oleanolic Acid, Fumaric Acid, Methyl Salicylate	Wound healing, Antimicrobial, Anti-diabetic	Stimulate collagen synthesis, promote tissue repair
Minerals/Nutrients	Calcium, Potassium, Magnesium, Sodium, Selenium	Cellular metabolism and electrolyte balance	Support cellular function and regeneration

Table No 4: Phytochemical Composition of Tridax Procumbens

MEDICINAL USE:-

The aqueous leaf extract of Tridax procumbens exhibits significant cardiovascular effects by effectively lowering heart rate and blood pressure. The lyophilized form of the aqueous leaf extract demonstrates anti-inflammatory activity comparable to standard drugs such as ibuprofen and aspirin. The whole aerial parts of the plant possess hepatoprotective and antisecretory (antidiarrheal) properties, along with notable antibacterial, antiprotozoal, and antifungal activities. Additionally, the leaf juice promotes healing in dead space wounds, while the seeds are traditionally used to control various types of bleeding. The aqueous extract of the aerial parts shows immunomodulatory potential, and the dry extract retains antibiotic activity even when incorporated into a mineral base (20)

TRADITIONAL USE:-

In Nigeria, the whole plant of Tridax procumbens is traditionally used to treat various ailments such as typhoid fever, cough, fever, stomachache, backache, diarrhea, and epilepsy. In Africa, farmers utilize the plant for veterinary purposes; for instance, Tridax is combined with Vigna parkeri to manage chronic mastitis by grinding both plants with salt and water, then applying the mixture to the udder. Studies on the antibacterial properties of Tridax against mastitis-causing bacteria revealed that the ethanolic extract exhibited significant activity against Staphylococcus aureus, whereas the aqueous extract showed minimal or no effect against Streptococcus uberis and Klebsiella pneumoniae compared to Spathodea campanulata extracts.

In Benin, livestock breeders supplement rabbit and other animal feed with Tridax, although its low palatability leads to reduced consumption compared to other fodder. In Togo, crushed fresh leaves are applied to wounds for healing, and leaf decoctions are used to relieve pain, treat malaria, and manage abdominal and gastrointestinal fungal infections.

In India, T. procumbens serves as an insect repellent and is used to treat diarrhea, hemorrhages, and hair loss. A study conducted in Tamil Nadu reported that locals apply the leaf juice directly to wounds to promote healing, confirming the plant's significance in traditional medicine. Additionally, T. procumbens is known to be rich in essential minerals such as calcium, selenium, magnesium, potassium, and sodium. In Udaipur, powdered leaves mixed with other herbs are traditionally consumed to manage diabetes. The high potassium content also contributes to its use in treating muscle cramps, emphasizing the plant's potential as a safe and valuable source for future medicinal applications (21)

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

Mechanism of Action of Tridax procumbens in Wound Healing:- (24)

Healing Phase	Mechanism Description
Hemostasis	Tannins induce clotting at the wound site, effectively controlling bleeding and stabilizing the wound bed to initiate healing
Inflammatory Modulation	Reduces excessive cytokine response,
	preventing prolonged inflammation while allowing necessary immune action for healing.
Proliferation	Stimulates fibroblast proliferation and collagen synthesis, promoting new tissue formation, wound contraction, and angiogenesis for nutrient supply.
Remodeling	Enhances extracellular matrix remodeling and maturation, increasing collagen fiber organization and tensile strength of healed tissue.
Procumbenase Effect	A serine protease from T. procumbens that accelerates scar-free healing by increasing hydroxyproline content and wound tensile strength

Table No 5:-Mechanism of Action Of Tridax Procumbens in Wound Healing

Extraction methods for wound healing compounds from Tridax procumbens:

Solvent System	Extraction Method	Key Compounds Extract	Advantages
Ethanol (70-95%)	Soxhlet, Ultrasonic Assisted Extract (UAE), Microwave Assisted Extract (MAE)	Flavonoids, tannins, alkaloids, saponins	Efficient, preserves bioactive compounds
Methanol	Soxhlet, UAE, MAE	Flavonoids, phenolics, alkaloids	Good polarity, effective for polar compounds
Water	Maceration, Decoction	Hydrophilic compounds	Safe, non-toxic, limited extraction of non-polar compounds
Ethyl Acetate	Soxhlet	Moderately polar flavonoids, polyphenols	Selective extraction, good for semi-polar compounds
Hexane	Soxhlet	Non-polar compounds (essential lipids) oils,	Extracts non-polar components, less relevant for wound healing actives
Solvent mixtures (Ethanol + Water)	UAE, MAE	Broad spectrum of phytochemicals	Synergistic extraction, better yield

PHARMACOLOGICAL ACTIVITY :-

Tridax Procumbens exhibits a wide range of therapeutic activities, including antimicrobial, antioxidant, antibiotic, wound-healing, insecticidal, and anti-inflammatory properties. It is also known to be effective against diarrhea and

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

dysentery. The leaf juice is traditionally used to treat fresh wounds, stop bleeding, and promote hair growth as a natural tonic. In India, Tridax procumbens is widely utilized for wound healing, as an anticoagulant, antifungal, and insect repellent. In folk medicine, its leaf extract has been employed to manage infectious skin diseases. Additionally, the plant acts as a bioadsorbent for the removal of toxic chromium (Cr VI) from industrial wastewater. Furthermore, Tridax procumbens is recognized for its hepatoprotective effects, being used in the treatment of liver disorders, gastritis, and heartburn.(26)

Antidiabetic activity:- Diabetes mellitus is a widespread disease globally and is recognized among the top 10, possibly even the top 5, most prevalent diseases. Historically, it has been known in India since prehistoric times and is referred to as madhumeha, characterized by the presence of sugar in the urine and bodily fluids such as perspiration and mucus. Studies have shown that dried leaf extracts of Tridax procumbens, prepared in aqueous, alcoholic, and petroleum ether solvents, exhibit significant hypoglycemic effects in

Wistar rats, demonstrating its potential to lower blood sugar levels effectively (27)

Anti-inflammatory Activity:-Tridax procumbens demonstrates significant antiinflammatory activity by inhibiting key mediators such as prostaglandins and cytokines, reducing edema and inflammatory cell infiltration, and stabilizing cell membranes and lysosomes. Evidence from review literature highlights its multi-mechanistic action in regulating inflammatory pathways, validating its traditional uses and underscoring its potential as a promising therapeutic agent.(28)

ANTIOXIDANT ACTIVITY:-Tridax procumbens exhibits strong antioxidant activity

by effectively scavenging free radicals, protecting damaged tissues from oxidative stress, and restoring essential antioxidant enzymes such as SOD, CAT, and GPx. These combined mechanisms highlight its potential in mitigating oxidative damage and supporting tissue repair.(29)

PRECLINICAL EVIDENCE:-

Preclinical evidence from a wide range of in vitro and in vivo studies has clearly demonstrated the effectiveness of Tridax procumbens extracts and formulations in promoting wound healing.

IN VITRO STUDIES :-

In vitro experiments on L929 fibroblast cell lines showed remarkably high proliferation rates (up to 98%) and substantial scratch-wound closure (up to 94%) within just 24 hours, with no signs of cytotoxicity. These outcomes suggest that the extract strongly promotes cell migration, proliferation, and epithelialization—key processes required for effective wound healing.(30)

IN VIVO STUDIES :-

In vivo studies conducted on mice and rats consistently demonstrated faster wound contraction, greater collagen fiber deposition, increased fibroblast activity, improved reepithelialization, and quicker overall wound closure, especially when Tridax procumbens was applied in the form of ointments or film-based formulations.(31)

APPLICATION IN WOUND HEALING AND SKIN REGENERATION

1.Wound Dressing Films

Carboxymethylcellulose (CMC) films infused with Tridax procumbens extract have demonstrated strong wound-healing potential. These films significantly boost fibroblast proliferation (over 95%), stimulate collagen fiber formation, and speed up wound closure in animal models, typically within 10 days. In addition, they exhibit notable antibacterial activity and provide controlled release of bioactive compounds such as quercetin, making them ideal for advanced wound dressings that aid tissue regeneration and help prevent infections.(32)

2.Anti-inflammatory and Antimicrobial Effects:-

The plant shows potent anti-inflammatory effects that minimize swelling and discomfort, while also protecting wounds from infections. Its antimicrobial action assists in managing wound-site pathogens, thereby creating a more favorable environment for effective healing.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

3.Antioxidant Protection:-
Rich in antioxidants, Tridax procumbens protects the wound area from oxidative stress and free radical damage, which can otherwise delay healing and damage regenerating tissue
4.Skin Regeneration:-
Besides wound healing, it is effective in skin regeneration by promoting the proliferation of skin cells, improving skin barrier repair, and hydrating the skin. This makes it useful in formulations for dermatological conditions like eczema, rashes, and minor skin injuries.
5.Formulation Potential:-
Research shows its efficacy in various forms including topical applications like ointments, creams, and hydrogel/film dressings. Studies highlight its benefits in both diabetic and nondiabetic wound models, indicating broad therapeutic potential.(33)
6.Anti-Aging:-
The antioxidant activity of T. procumbens helps counteract oxidative stress, a key contributor to skin aging.
7.Acne Management:-
With its strong antimicrobial and anti-inflammatory properties, T. procumbens may be useful in acne care by lowering bacterial presence and reducing inflammation in acne-affected areas.
8.Barrier Restoration:-
By promoting collagen production, T. procumbens can support skin barrier repair and improve overall hydration, making it suitable for skincare formulations aimed at barrier strengthening.(34)

CHALLENGES:-
1.Dose-Dependent Effects:-
The wound-healing activity of Tridax procumbens extracts is dose-dependent. Moderate concentrations enhance fibroblast growth and boost collagen production, aiding tissue repair, whereas higher doses may actually hinder the healing process, making it challenging to establish an optimal standardized dosage. (22)
2.Extraction and Formulation Issues:-
Refining extraction techniques to retain key bioactives like flavonoids and tannins, while achieving efficient delivery through ointments, films, or gels, remains a significant challenge. Achieving the right balance between stability, release behavior, and compatibility with carriers such as carboxymethyl cellulose (CMC) or polyvinyl alcohol (PVA) is essential to optimize therapeutic performance.(32)
3.Variability in Effectiveness:-
Studies have noted variations in wound-healing effectiveness between diabetic and nondiabetic conditions. In diabetic models, the healing response is often less significant, suggesting that certain treatments may have reduced efficacy or limitations in specific patient groups.(35)

FUTURE PROSPECTS :-
1.Novel Formulations:
Recent research highlights innovative delivery approaches such as nanosponge-based gels, which improve the bioavailability, stability, and overall wound-healing performance of Tridax procumbens extracts. These advanced formulations have shown notably faster wound closure in animal studies when compared with conventional therapies, suggesting that nanotechnology-driven enhancements can significantly boost their therapeutic effectiveness.(36)
2.Topical Herbal Gels:
Formulation and assessment of topical gels containing Tridax procumbens extracts are currently being explored, with optimization focused on key physicochemical parameters such as pH, viscosity, and spreadability to ensure effective skin application. These gel systems merge the traditional therapeutic value of the herb with contemporary pharmaceutical techniques, resulting in improved skin adherence and enhanced patient compliance.(37)

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

3.Molecular Insights and Phytoconstituents:

Ongoing molecular investigations have pinpointed major phytocompounds— including quercetin, caffeic acid, kaempferol, and tannic acid— that interact with proteins essential to the wound-healing process. These findings provide a strong foundation for creating more targeted and effective therapeutic agents derived from the plant.(38)

4.Clinical Translation:

Growing efforts are being made to transition from preclinical studies to clinical trials in order to confirm safety, efficacy, and appropriate dosing in humans. While most available data remain preclinical, continued research is setting the stage for future clinical validation and potential pharmaceutical commercialization.(39)

5.Combination Therapies and Novel Applications:

Tridax procumbens shows promise for use in combination with modern therapeutics or other herbal agents to achieve synergistic benefits, particularly for managing chronic wounds, diabetic ulcers, and skin regeneration issues. Its diverse pharmacological actions—antiinflammatory, antimicrobial, and antioxidant—position it as a valuable component in integrated wound-care approaches.(40)

6.Sustainability and Accessibility:

As an easily accessible medicinal plant, Tridax procumbens serves as a cost-effective and sustainable resource for developing wound-care products, particularly in low-resource regions. Its availability supports the production of affordable phytopharmaceuticals, potentially improving access to effective treatment options.(37)

II. CONCLUSION

Based on its complex phytochemical profile and historic use, Tridax procumbens is a powerful medicinal herb with strong wound-healing and skin-regenerative qualities. Its antibacterial, anti-inflammatory, antioxidant, and collagen-stimulating properties efficiently regulate all stages of wound healing, including hemostasis, inflammation, proliferation, and remodeling. Although preclinical research yields encouraging results, additional clinical validation is necessary to determine its safety, effectiveness, and therapeutic potential in contemporary wound care applications.

REFERENCES

1. Wankhade S, Kishtiaj Y, Khirsadkar P, Katekar V, Deshmukh PS. Review article on wound healing properties of ―Tridax procumbens ‖ . Indo Am J Pharm Sci. 2024;11(2):418-22.
2. Agyare C, Akindele AJ, Steenkamp V. Natural products and/or isolated compounds on wound healing. Evid Based Complement Alternat Med. 2019;2019:1-12.
3. Sorg H, Tilkorn DJ, Hager S, Hauser J, Mirastschijski U. Skin wound healing: an update on the current knowledge and concepts. Eur Surg Res. 2017;58(1-2):81-94.
4. Ryall C, Duarah S, Chen S, Yu H, Wen J. Advancements in skin delivery of natural bioactive products for wound management: a brief review of two decades. Pharmaceutics. 2022;14(5):1072.
5. Vitale S, Colanero S, Placidi M, Di Emidio G, Tatone C, Amicarelli F, D'Alessandro AM. Phytochemistry and biological activity of medicinal plants in wound healing: an overview of current research. Molecules. 2022;27(11):3566.
6. Martin P. Wound healing—aiming for perfect skin regeneration. Science. 1997;276(5309):75-81.
7. Koh TJ, DiPietro LA. Inflammation and wound healing: the role of the macrophage. Expert Rev Mol Med. 2011;13:e23.
8. Pasupuleti VR, Sammugam L, Ramesh N, Gan SH. Honey, propolis, and royal jelly: a comprehensive review of their biological actions and health benefits. Oxid Med Cell Longev. 2017;2017:1259510.
9. Rodrigues M, Kosaric N, Bonham CA, Gurtner GC. Wound healing: a cellular perspective. Physiol Rev. 2019;99(1):665-706.
10. Moretti L, Stalfort J, Barker TH, Abebayehu D. The interplay of fibroblasts, the extracellular matrix, and inflammation in scar formation. J Biol Chem. 2022;298(6):101530.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 5, March 2026 Impact Factor: 8.2

11. Xue M, Jackson CJ. Extracellular matrix reorganization during wound healing and its impact on abnormal scarring. Adv Wound Care. 2015;4(3):119-36.
12. Chen H, Li G, Liu Y, Ji S, Li Y, Xiang J, et al. Pleiotropic roles of CXCR4 in wound repair and regeneration. Front Immunol. 2021;12:668758.
13. Zou ML, Teng YY, Wu JJ, Liu SY, Tang XY, Jia Y, et al. Fibroblasts: heterogeneous cells with potential in regenerative therapy for scarless wound healing. Front Cell Dev Biol. 2021;9:713605.
14. Eriksson E, Liu PY, Schultz GS, Martins-Green MM, Tanaka R, Weir D, et al. Chronic wounds: treatment consensus. Wound Repair Regen. 2022;30(2):156-71.
15. Czubryt MP. Common threads in cardiac fibrosis, infarct scar formation, and wound healing. Fibrogenesis Tissue Repair. 2012;5(1):19.
16. Chaudhari HC, Pati KP. A review on medicinal importance of Tridax procumbens Linn. Res Rev Pharm Sci. 2022;11(1):1-8.
17. Ahmed SS, Prakash CK, Tabassum S, Salma N, Ahalya Devi KH. Pharmacognostical and pharmacological review on Tridax procumbens Linn. Res J Pharmacol Pharmacodyn. 2019;11(1):11-16.
18. Amutha R, et al. Tridax procumbens (Coat Button) – A gift of nature: an overview. In: Pharmacological Benefits of Natural Products. 1st ed. 2019. P.193-212.
19. Sharma R, Saini A, Priya S, Thakur U, Ankalgi AD. A comprehensive review on plant Tridax procumbens and analytical methods for its active constituents. IJRASET. 2023;11(12):1-10.
20. Chaudhari HC, Pati KP. A review on medicinal importance of Tridax procumbens Linn. Res Rev Pharm Pharm Sci. 2022;11(1):1-9. 1.
21. Beck S, et al. A review of medicinal uses and pharmacological activities of Tridax procumbens (L.). J Plant Stud. 2018;7(1):19–35.
22. Yaduvanshi B, Mathur R, Mathur SR, Velpandian T. Evaluation of wound healing potential of topical formulation of leaf juice of Tridax procumbens L. in mice. Indian J Pharm Sci. 2011;73(3):303–6.
23. Ikewuchi CC, Ikewuchi JC, Ifeanacho MO. Phytochemical composition of Tridax procumbens Linn leaves: potential as a functional food. Food Nutr Sci. 2015;6(11):990–1004.
24. Rajalakshmi P, et al. Review on wound healing property of Tridax procumbens. Int J Pharm Res Appl. 2023;8(1):1724–9.
25. Shaamik P, Itu A, Chattarjee S, Dey T, Roy S. Review article on QbD approaches to improve nanotechnology-based drug product. Int J Pharm Sci Res. 2025;16(11):2890– 903.
26. Chaudhari HC, Patil KP. A review on medicinal importance of Tridax procumbens Linn. Res Rev Pharm Sci. 2022;11(2):1–7.
27. Bhagwat DA, Killedar SG, Adnaik RS. Anti-diabetic activity of leaf extract of Tridax procumbens. Int J Green Pharm. 2008;2(2):126–9.
28. Kavitha R, Prasanna G. Phytochemical screening and in vitro anti-inflammatory activity of aerial parts of Tridax procumbens L. Int J Pharm Sci Rev Res. 2018;50(2):115–20.
29. Jangid T, Jain A, Bhardwaj GS, Jangir RN. A comprehensive review on traditional uses, phytochemical constituents, and pharmacological properties of Tridax procumbens. J Phytopharmacol. 2025;14(4):223–46.
30. Tripathi N, Makode D, Jawade V, Verma M, Kanwar JR, Chowdhary R, et al. Exploring the wound healing potential of Tridax procumbens extract: in vitro cytotoxicity and scratch assay studies. SSR Inst Int J Life Sci. 2024;10(2):5146–51.
31. Deshmukh R, Agrawal R, Chauragde S, Lilhare S, Mishra MU. Formulation and evaluation of ointment containing natural wound healing activity of Tridax procumbens. Res J Pharm Technol. 2018;11(10):1–5. (Page numbers incomplete in source—added minimal placeholder.)
32. Chinnappan BA, Krishnaswamy M, Bal T, Rajora AD. In vitro–in vivo wound healing efficacy of Tridax procumbens extract-loaded carboxymethylcellulose film. Int J Biol Macromol. 2023;253(Pt 1):126695.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 5, March 2026
Impact Factor: 8.2

33. Gavhane A, Bhagwat A, Kale A, Garje S, Sayyad G. Tridax procumbens: a weed with multimedicinal properties. Int Res J Modern Eng Technol Sci. 2024;6(3):3578.
34. Khilare H, Shabadi R, Sable VU, Mhetre R. Wound healing and skin care applications of Tridax procumbens: a review of evidence and mechanism. Int J Res Publ Rev. 2004;3(11):5341–4.
35. Shrivastav A, Mishra AK, Abid M, Ahmad A, Fabuzinadah M, Khan NA. Extracts of Tridax procumbens Linn leaves causes wound healing in diabetic and non-diabetic laboratory animals. Wound Med. 2020;29:100185.
36. Kalebag SK, Bhosale AS, Bade OB, Puttawar SH, Patil GB. Revolutionizing wound treatment: formulation and evaluation of Tridax procumbens loaded nanosponge-based topical gel. Res J Pharm Technol. 2025;18(8):1–8. (Pages incomplete in source.)
37. Sardar RR, Dongare KA, Suruwase KP. Exploring the effect of Tridax procumbens gel on wound healing. Indo Am J Pharm Sci. 2025;12(5):375–83.
38. Jeevitha M, Kaarthikeyan G, Yadalam PK, Kumar R, Kumar JK. Exploration of wound healing activity of phytocompounds from Tridax procumbens using computation approach. J Pioneering Med Sci. 2023;12(3):20–4.
39. Shrivastav A, Mishra AK, Abid M, Ahmad A, Fabuzinadah M, Khan NA. Extracts of Tridax procumbens Linn leaves causes wound healing in diabetic and Non-diabetic laboratory animals. Wound Med. 2020;29:100185.
40. Cheriyan S, Shin H, Razack SA, Kang M, Boopathi TS, Kang HW, Mani K. In-vitro and in-vivo studies of Tridax procumbens leaf extract incorporated bilayer PCL/PVA-chitosan electrospun nanofiber for wound dressing application. Int J Biol Macromol. 2025;299:139920.
41. Ahmed SS, Prakash CK, Tabassum S, Salma N, Devi AKH. Pharmacognostical and pharmacological review on Tridax procumbens Linn. Res J Pharmacol Pharmacodyn. 2019;11(1):11–16.