Tridax Procumbens And Its Wound Healing Properties - A Comprehensive Review

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Abstract

Tridax Procumbens is common medicinal herb commonly known as Coat Buttons or Mexican daisy. This herbaceous plant, belonging to the Asteraceae family, it is native to the Americas but has spread to various parts of the world. This plant majorly used for the medicinal used they are tradinal medicines of Indian.

The Tridax Procumbens are the species of flowering plant. The plant shown various pharmacologic activity like wound healing, antibacterial, antidiabetic, anticancer, antiparkinsons, antarthritic, hypotensive, anti-inflammatory, immunomodulatory, ant obesity, wound healing, analgesic, antifungal, antiarthritic, antihyperglycemic hepatoprotective, anti-helminthic, anticonvulsant and antioxidant. The leaf extract of Tridax Procumbens. Leaf powder of ethanol was used in this study. The leaf extraction was tested for the presence of tannin, saponins, terpenoids, flavonoids, glycosides, alkaloids, protein. This review provides information on the traditional use and pharmacological actions.

***Key Points*: Tridax Procumbens linn, Wound healing activity, flavonoids, tannins.**

INTRODUCTION

Wound healing is a sophisticated process involving tissue restoration following injury or damage. A wound is described as disrupting the normal continuity of the skin, leading to a break in its cellular and anatomical structures, thereby affecting its regular functionality. This intricate process can be classified based on the wound's location, origin, presenting symptoms, type of injury, depth, tissue loss, or clinical appearance. A comprehensive understanding of the multifaceted nature of wounds crucial for developing effective strategies for their management and promoting optimal healing outcomes.[1]

The healing process can be conceptualized into three overlapping phases: inflammation, cellular proliferation, and remodelling. These phases are carefully orchestrated to ensure the restoration of normal tissue function.[2] During the initial inflammatory phase, the body responds to the injury by eliminating pathogens and cellular debris through the influx of cytokines and growth factors. Subsequently, the cellular proliferation phase involves the formation of granulation tissue through processes like angiogenesis, with keratinocytes and fibroblasts migrating to the wound site. The maturation phase is marked by restoring the skin barrier, repairing granulation tissue within the scar, and vessel regression.[3] This newly formed tissue gradually gains tensile strength, with collagen production, cross-linking, and reorganization occurring over an extended period.[4] The accurate and regular progression of these phases is crucial, as interruptions or prolongations can lead to

chronic wounds delayed healing, often associated with conditions such as ischemia, diabetes, and hypertension.[5]

To enhance the quality and speed of the healing process, synthetic drugs like nitrofurazone, gentamicin, and mupirocin are commonly used, which have many side effects. In recent years, there has been a growing trend towards using natural medicines to mitigate these drawbacks.[6] Many medicinal plants, with a long history of efficacy in various diseases, have been explored for their potential in wound healing. However, despite their traditional use, there is often a lack of scientific data or information to prove their effectiveness, understand their active ingredients, or elucidate their mechanisms of action.[7]

The mechanism of wound healing involves four main phases**:**

1. Hemostasis: Blood clotting stops bleeding.
2. *Inflammation*: Immune cells remove debris and prevent infection.
3. *Proliferation*: New tissue, blood vessels, and collagen form.
4. *Remodeling*: Collagen is reorganized, and the wound contracts to restore strength.

These phases overlap and work together to restore tissue integrity.

Drug Profile

General Name: Tridax Procumbens
Kingdom : Plantae
Sub kingdom : Tracheobionta
Division : Spermatophyta
Subdivision : Magnoliophyta
Class : Magnoliopsida
Subclass: Asteridae
Order : Asterales
Family : Asteraceae
Genus : Tridax
Species: procumbens L-(Coat buttons)
Chemical Constituents:

1. Tannin: convert gray hair into black hair**.**
2. Saponin: Antifungal and Antibacterial activity.
3. Flavonoids: Antioxident effect.
4. Beta-Sitosteriol: Reduce hair loss.
5. Gluco luteolin: Reducing dandruff,prevent breakage.

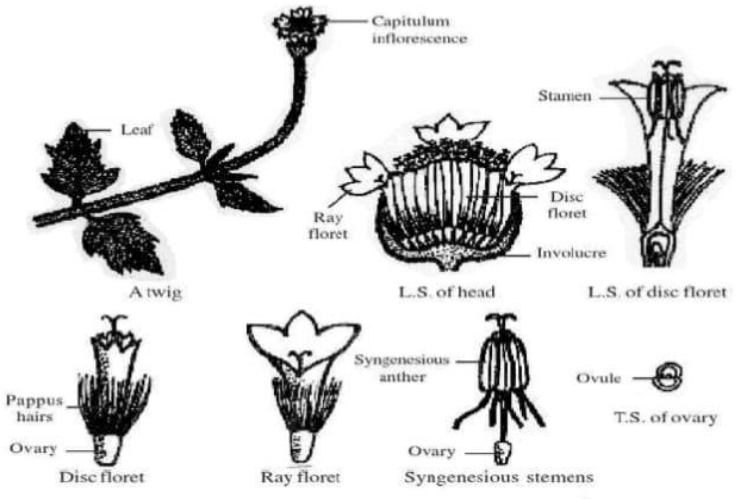

Fig 1: Parts of Tridax Procumbens.

Fig 2: Tridax Procumbens Linn (Coat Buttons).

Studies on Tridax Procumbens:

1. Prolongation of Clotting time:

T. procumbens extract 200 mg/µg IP injected to experimental rabbits, reduced normal heparin induced prolongation of clotting time.[8]

2. Wound Healing activity:

Aqueous extract of Aloe vera (leaves), Aegle marmelos (root and root bark), Moringa olifera (root and rootbark) and T. procumbens (leaves) not only promoted healing but also overcame steroid depressed healing in experimental male wistar rats. The increased lysyl oxidase activity induced by the preparation has been suggested to be responsible for wound healing activity. The increased nucleic acid level indicates the action at cellular level.[9] Dexamethasone 0.33 mg/kg IM on first day and half this dose thereafter daily, depressed wound contraction, epithelization, tensile strength and process of granulation of wounds in experimental animals. Juice from the leaves of T. procumbens (T.P.1ml, 1.P., daily) resembled dexamethasone in effects on wound contraction and granulation; but it significantly counteracted the effects of dexamethasone on tensile strength and epithelization. TP caused increase in adrenal weight and in thymus weight. These observations suggest that TP exerts a direct prohealing effect along with an indirect antihealing influences probably mediated through release of adrenal steroids, along with an indirect antihealing influences probably mediated through release of adrenal steroids.[10]

3. Cardiovascular effects:

The cardiovascular effects of aqueous extract from leaf of T. procumbens were investigated on anaesthetized Sprague-Dawley rat. The IV administration of 3, 6, and 9 mg/kg of aqueous extract caused significant decrease in mean arterial blood pressure in a dose related manner. Higher doses of drug also cause significant reduction in heart rate. The hypotensive and Bradycardiac effects were immediate. The hypotensive effect was inhibited by pretreatment of animal with atropine sulphate (1mg/kg).[11]

4. Hepatoprotective activity:

Hepatoprotective effect of ethanolic extract of arial parts of T. procumbens and its chloroform soluble and insoluble fractions were studied on acute hepatitis induced in rats by single dose of carbon tetrachloride, Acute and chronic models of hepatic damage were studied recording morphology, metabolic, histological and

biochemical parameter. T. procumbens demonstrated antihepatotoxic action justifying its use in liver affection. Only the ethanolic extract and chloroform insoluble fraction exhibited hepatoprotective activity.[12]

5. Antimicrobial activity:

A new flavone (C28H 24011, mp.2740C) isolated from the leaves of T. procumbens identified as 5, 7, 4-trihydroxy-6, 3-dimethoxy flavone-5-O-alpha rhamnopyranoside (Glycoside) (Yadava and Saurabh, 19981). The dry extracts of Acalpha indica, T. procumbens and Azadirachta indica were screened and compared for antibiotic activity. Their antibiotic activity was retained when formulated in mineral base and was more than that of Penicillin G (Devi and Suneeta, 1990). Antibacterial activity of aqueous extracts of 16 different ethnomedicinal plants at two different weights of plant residue, 30 and 40 mg has been tested against three gram positive bacteria and seven gram negative bacteria by the filter paper disc diffusion method. The maximum inhibition was observed by T. procumbens against aeromonas hydrophilla and bacillus cereus.[13]

6.Anti-inflammatory activity:

The aqueous extract of T. procumbens leaves was lyophilized and studied on the excision wound model, rat skin fibroblast and rat paw oedema. T. procumbens did not significantly increase the fibroblast could compared with ibuprofen. Wound contraction was compared in the T. procumbens and ibuprofen treated groups. Epithelialization was significant in T. procumbens group. The aspirin treated group showed significant retardation in both parameters. The fibroblast cell count, hydroxyproline/DNA ratio collagen synthesis was insignificant in the control and T. procumbens treatment while ibuprofen and aspirin treatment had a significant effect on the above mentioned parameters. In the carrageenan induced Oedema model, inhibition of Oedema was comparable in 200mg/kg Tridax procumbens and 50mg/kg ibuprofen treatment and the specific activity of the enzyme gamma glutamyl transpeptidase was comparable in the Tridax procumbens, ibuprofen and aspirin at 200 mg/kg.[14]

7. Antiprotozoal activity

Extract prepared from 13 native plants used for the treatment of protozoal infections, were evaluated invitro against epimastigote and tripomastigotes and invivo against tripomastigotes. From the plants screened, six showed activity against bacteria, three against yeasts, five against Microsporum gypsum and five against Trypanosoma cruzei in vitro. In-vitro and invivo activity was demonstrated by Varolaena lobata and Solanum americanum: in-vitro or in vivo activity was shown by Acalypha guatemalensis, Petiveria alliacea and T. procumbens, S. americanum was found to be toxic to Artemia salina (Aqueous, 160ppm) None showed acute or oral toxicity to mice. S. americanum showed IP subacute toxicity.[15]

8. Hair growth promoting activity:

The ethanolic extract aerial parts T. procumbens was investigated for hair growth promoting. properties. It was administrated albino rats as 10% ointment as well as orally (100mg/kg/day) for 20 days both treatments were effective. To total the activity in extract function with different solvents are undertaken and the fraction evaluated for this property petrol fractactive. Column chromatography of petrol function and screening of same suggested the activity in initial function. Animals are divided in three groups of 25 animals. The rats those receives oral dose of ethanolic extract shows increased growth of the hairs where as rats of control group remained almost devoid of hair. Same observations were recorded in the animals, which were treated with ointment. It was also observed that till 10th day of treatment there was no activity at all the process of hair growth started by 14th day and was almost complete in 21 dayion was found.[16]

Chemical constituents:

T. procumbens contains flavone glycosides, chromone glycosides, sterols and polysaccharides with a Beta-1,6-D-galactan main chain. Unsaponifiable fraction of petroleum ether fraction revealed the presence of campesterol, stigmasterol and beta- sitosterol by GC-MS.[17] The ethyl acetate soluble part of hexane extract yielded a new bithiophene named tri-bisbithiophene along with four terpenoids: taraxasteryl acetate, beta-amyranone, lupeol and oleanolic acid. A new flavonoid (Procumbenetin) isolated from arial part of T. procumbens has been characterized as 3, 6- dimethoxy-5, 7, 2, 3, 4'-pentahydroxy flavones, 7- O-beta-3-

glucopyranoside (12) Eight new compounds, isolated from Tridax procumbens, have been characterized as methyl 14- oxooctadecanoate, methyl 14-oxononacosanoate, 3- methylnonadecylbenzene, heptacosanyl cyclohexane caprylate, 1(2,2-dimethyl-3- hydroxypropyl)-2-isobutyl phthalate, hydroxytetracosan-15-one, 12- 32-methyl-30oxotetratriacont-31-en-1-ol and 30-methyl-28- oxodotriacont-29-en-1-oic acid by spectral data and chemical studies. Nine known compounds isolated for the first time from the plant, were identified as dotriacontanol, B-amyrone, 12- dehydrolupen-3-one, Bamyrin, lupeol, fucosterol, 9-oxoheptadecane, 10-oxononadecane and sitosterol.[18]

Medicinal uses :

Aqueous leaves extract posses cardiovascular effect and significantly reduces heart rate and blood pressure. Lyophilized aqueous leaf extract showed antiinflammatory action comparable to ibuprofen and aspirin. Whole arial parts have hepatoprotective, antisecretory (antidiarrhoeal) activity. It is active against bacteria, protozoa and fungi. Leaf juice is useful in dead space wound healing. Seeds are used to check all types of bleeding. Aqueous extract of whole arial part is used as immunomodulator. Dry extract showed antibiotic activity even when formulated in mineral base.[19]

The selected plant Tridax procumbens have occupied an important place in Indian culture and folk medicines. This plant have been extensively in ayurvedic system of medicine and is used throughout India. It is used in Ayurvedic medicine for liver disorders hepatoprotection, gastritis and heatburn The plant shows various pharmacological activities like immunomodulatory, Anti-diabetic Anti- hepatotoxic, Anti-oxidant, Anti-inflammatory. Analgesic ete.[20]

Wound Healing :

Wound healing is the biological process by which the body repairs and regenerates tissue after injury. It involves a series of well-coordinated stages that restore the skin or other tissues to their normal function following damage, such as cuts, burns, or surgical incisions. This process relies on the body's ability to close the wound, prevent infection, and rebuild the damaged tissue through cellular and molecular activities, including clot formation, inflammation, tissue regrowth, and tissue remodeling.

Wound healing is crucial for maintaining the integrity of the skin and other tissues, which act as barriers against external threats like infection and physical harm.

The stages of wound healing[21] :

- Hemostasis.
- Inflammation.
- Proliferation.
- Maturation/ Remodeling.

1.Hemostasis (Immediate Response)

Purpose: To stop bleeding.

What Happens: Blood vessels constrict to reduce blood flow, and platelets form a clot to seal the wound. This clot forms a barrier to protect against further blood loss and starts the healing process.

2.Inflammation (Days 1–4)

Purpose: To prevent infection and clean the wound.

What Happens: Immune cells like neutrophils and macrophages arrive at the wound site to remove bacteria, debris, and dead tissue. This phase is marked by redness, swelling, warmth, and pain due to increased blood flow and immune activity.

3.Proliferation (Days 4–21)

Purpose: To rebuild the tissue.

What Happens: New tissue forms through collagen production, which strengthens the wound. Granulation tissue, which includes new blood vessels, forms to support the healing. The edges of the wound begin to contract, and new skin (epithelial cells) begins to cover the area.

4.Remodeling or Maturation (Weeks to Months)

Purpose: To strengthen and restructure the new tissue.

What Happens: Collagen fibers are reorganized, and the wound continues to contract. Scar tissue forms, and while it is typically less flexible and weaker than normal tissue, this phase aims to restore as much function and strength as possible.

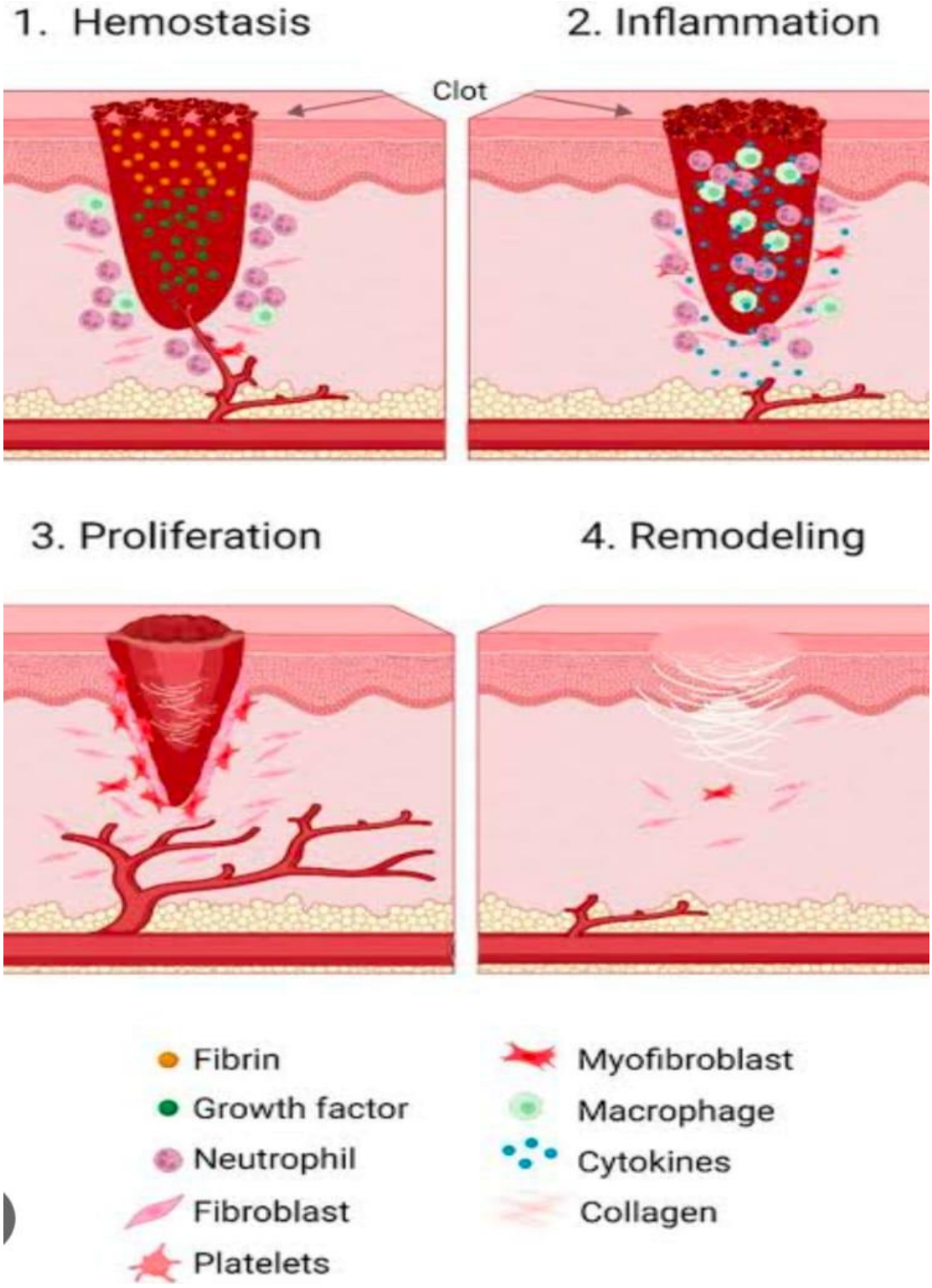

Fig 3 : Wound Healing Process.

Preperation of Extract from Tridax procumbens :

Tridax procumbens is a plant known for its medicinal properties. To prepare the download, do the following:

Materials Needed:

1. Fresh leaves or whole plant of Tridax procumbens
2. Ethanol, methanol, or distilled water (as solvent)
3. Mortar and pestle or blender
4. Filter paper or fine muslin cloth
5. Glass containers
6. Soxhlet apparatus (for continuous extraction, optional).

Procedure:

1. Collection:

Collect fresh Tridax procumbens leaves or whole plant.

Wash them thoroughly to remove any dirt or impurities.

2. Drying:

Air dry the plant material in a shaded area for a few days until fully dry, ensuring no direct sunlight, which can degrade active compounds.

3. Grinding:

Once dry, grind the plant material into a fine powder using a mortar and pestle or a blender.

4.Extraction:
a. Cold extraction (extraction method):

Weigh out the dry plant powder (eg 50 grams). Place the powder in 200-300 ml of ethanol, methanol or distilled water in a glass container. Close the container and leave for 24 to 72 hours, shaking occasionally. After soaking, filter the solution through filter paper or muslin cloth to remove solid particles. Pick the filter as your download.
b.Hot extraction (soxhlet method, optional): Place Tridax procumbens powder in a soxhlet apparatus. Use a good solvent such as ethanol. Soxhlet continues to extract the plant material over a period of time (4-6 hours). After extraction, evaporate the solvent to solidify the extract. for 24 to 72 hours, shaking occasionally. After soaking, filter the solution through filter paper or muslin cloth to remove solid particles. Pick the filter as your download. for 24 to 72 hours, shaking occasionally.
After soaking, filter the solution through filter paper or muslin cloth to remove solid particles.

5.Concentration (Optional):

To obtain a more concentrated extract, evaporate the solvent using a rotary evaporator or leave it in an open dish to allow the solvent to evaporate naturally. Store the concentrated extract in a dark glass bottle, preferably in the refrigerator, to maintain its stability.

Working of Tridax Procumbens on wound healing :

Tridax procumbens, commonly known as coat buttons or "Tridax daisy," is a plant widely recognized in traditional medicine for its potential healing properties, particularly in wound healing. Several scientific studies have explored its effects on wounds and have confirmed the plant's efficacy in promoting wound repair through various mechanisms.

1.Antimicrobial Properties:

One of the primary ways Tridax procumbens aids wound healing is through its strong antimicrobial properties. The plant contains bioactive compounds such as flavonoids, tannins, and alkaloids, which help combat bacterial infections that can impede the wound healing process. By controlling bacterial growth and preventing infections, Tridax procumbens allows for a cleaner wound environment, promoting faster recovery.

Bacterial Inhibition: The presence of compounds like tannins and flavonoids in Tridax procumbens has been shown to inhibit the growth of bacteria such as Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli. These are common pathogens that often infect wounds and delay healing.[22]

2. Anti-inflammatory Effects:

Inflammation is a natural part of the wound healing process, but excessive or prolonged inflammation can hinder proper healing. Tridax procumbens has been shown to exhibit significant anti-inflammatory activity, which helps modulate this phase of healing. By reducing inflammation, the plant facilitates faster wound closure and minimizes tissue damage.

Reduction in Pro-inflammatory Cytokines: The bioactive compounds in Tridax procumbens suppress the production of pro-inflammatory cytokines (such as TNF-α and IL-6), thus minimizing excessive inflammatory responses at the wound site.

3.Antioxidant Properties:

The oxidative stress caused by the production of free radicals during the inflammatory phase can delay wound healing. Tridax procumbens contains potent antioxidants, such as flavonoids and carotenoids, which help neutralize free radicals. This antioxidant activity protects the wound from oxidative damage and promotes the regeneration of healthy tissues.

Enhanced Cellular Regeneration: The antioxidant activity prevents cell and tissue damage, which is crucial for maintaining the integrity of the healing tissues and promoting the formation of new, healthy skin cells.

4. Hemostatic Action:

Hemostasis, the process of stopping bleeding, is a critical first step in wound healing. Studies have found that Tridax procumbens has hemostatic properties, meaning it can help stop bleeding by promoting clot formation. This is particularly beneficial in the initial stages of wound healing, where bleeding needs to be controlled for the body to begin the repair process.

Blood Clot Promotion: The plant contains alkaloids and other compounds that help activate the coagulation process, allowing for faster clot formation, which is necessary to stop bleeding and begin tissue repair.[23]

5. Promotion of Fibroblast Proliferation:

Fibroblasts are key cells involved in the wound healing process, as they help synthesize collagen and extracellular matrix, which are crucial for wound closure and tissue remodeling. Tridax procumbens has been shown to promote the proliferation of fibroblasts, thereby enhancing collagen synthesis and deposition at the wound site.

Collagen Synthesis: Collagen is the main structural protein in the skin and other connective tissues. The increased production of collagen facilitated by Tridax procumbens leads to stronger tissue formation and a faster rate of wound closure.

CONCLUSION

This review article is about Tridax procumbens which have been used to treat wounds, skin disorders and to stop blood clotting in traditional medicines. It also has various pharmacological activities like hepatoprotective activity, anti-inflammatory, antidiabetic activity, hypotensive activity, immunomodulatory activity, dysentery, prevent falling of hair, promotes hair growth and antimicrobial activity against both gram-

positive and gram-negative bacteria. The phytochemical screening of Tridas procumbens. shows the presence of chemical constituents like alkaloids, carotenoids, flavonoids (catechins and flavones), fumaric acid, saponins and tannins which is responsible for wound healing activity**.**Regulatory approval will be crucial for market introduction, and educating healthcare professionals and patients about this novel treatment option. Additionally, exploring the potential for synergistic effects with other wound-healing agents could lead to even more effective treatments. This approach not only aims to improve healing outcomes for diabetic wounds but also opens up new possibilities for natural, plant-based wound care solutions, potentially transforming the landscape of wound management for diabetic patient & beyond**.**

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