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FORMULATION AND EVALUATION OF TRIDAX GEL

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ABSTRACT:

Tridax procumbens, a widely distributed medicinal herb, possesses diverse pharmacological properties, including anti-inflammatory, antimicrobial, antioxidant, and wound-healing activities. The present study focuses on the formulation and evaluation of a herbal preparation incorporating Tridax procumbens extract for potential therapeutic applications. The plant was collected, authenticated, and subjected to phytochemical screening to confirm the presence of bioactive constituents such as flavonoids, alkaloids, and tannins. An ethanolic extract of Tridax procumbens was prepared and incorporated into a topical gel formulation.

The developed formulation was evaluated for physical characteristics, pH, spreadability, stability, and antimicrobial activity against selected bacterial strains. Results indicated that the formulated gel exhibited desirable physicochemical properties and significant antimicrobial efficacy, supporting the traditional use of Tridax procumbens in skin-related ailments. This study highlights the potential of Tridax procumbens as a promising natural agent for herbal product development, offering an effective and eco-friendly alternative to synthetic formulations.

INTRODUCTION:

The procumbens Linn., though a native of tropical America is also found in India, tropical Africa, Asia, Australia and India as a creeper weed. T. procumbens has been traditionally used in Ayurveda system for centuries and possesses different pharmacological properties including wound healing, anti-oxidant, antibacterial, antifungal, immunomodulatory, antiinflammatory, antidiabetic, vasorelaxant, antihyperlipidemic, analgesic, antiplasmodial, anticoagulation and antihepatic . The diverse biological activities are due to various phytochemicals present in the plant. The aim of this review is to critically evaluate T. procumbens as an important medicinal plant with emphasis on the in-vivo properties of the phytochemicals and their roles in signalling pathways that can be manipulated for specific pharmacological actions. Tridax procumbens, commonly known as coat buttons or tridax daisy, is a species of flowering plant in the daisy family. It is best known as awidespread weed and pest plant. It is native to the tropical Americas but it has been introduced to tropical, subtropical, and mild temperate regions worldwide. Traditionally, Tridax procumbens has been in use in India for wound healing, as anticoagulant, antifungal and insect repellent. It were known to treat infectious skin diseases in folk medicines. It is a well-known ayurvedic medicine for liver disorders or hepato-protective nature besides gastritis and heart burn. A study was carried out to verify the claims wherein tribal inhabitants of Udaipur district, Rajasthan were using the plant for treatment of diabetes. It was concluded that the results were comparable to that of reference standard Glibenclamide and the Tridax procumbens flower extract showed antidiabetic properties.





FIG. NO.1 TRIDAX PROCUMBENS

Skin:-

Skin is the thick, protective covering of body Which is broadly segregated into three basic layers such as

- 1. Epidermis
- 2. Dermis

3. Hypodermis

Skin appendages include eccrine glands (sweat), apocrine glands, sebaceous glands and hair.

1. Epidermis :- it is the uppermost multi layer of the skin, composed of stratified keratinized squamous epithelium. Superficial, thinner portion of epithelial tissues.

Epidermis contains four principles types of celles

- Keratinomycetes (90%)
- Melanocytes
- Langerhans's cells
- Markel cells

Epidermis divided into 5 sub layers

a) Stratum corneum (Horny layer)

b) Stratum lucidum

c) Stratum granulosum (granular layer)

d) Stratum spinosum (prickly cell layer)

e) Stratum geminativum (basal layer & dermoepidermal junction)

2. The dermis :- Dermis, beneath the epidermis contains tough connective tissue, hair follicles and sweat glands and is much thicker than the epidermis. (1.5mm) this layer situated between the basement membrane zone and the sub-cutaneous layer the primary role of the dermis to sustain and support the epidermis. The superficial potion of dermis called papillary layer which consist of areolar connective tissues containing fine elastin fibers. Blood vessels, nerve glands and hair ama scene are embedded in dermal tissues. The dermis contains two layers

a. Papillary layer

b. Reticular layer

3. Hypodermis/ subcutaneous tissue :- hypodermis is made up of fat and connective tissue. Provides the main structural support for the skin, as well as insulating the body from cold and aiding shock adsorption. Consists of areolar and adipose tissue



LITERATURE OF SURVEY

Kumar et al., 2024

Traditional Uses and Ethnopharmacology Tridax procumbens, commonly referred to as coat buttons or tridax daisy, has a rich history of use in traditional medicine across various cultures. It has been utilized for its wound healing, anti-inflammatory, and antimicrobial properties. Studies highlight its use in Ayurveda for treating skin infections, wounds, and liver disorders, reflecting its significance in folk medicine; Phytochemical Composition The plant is rich in bioactive compounds, including flavonoids (quercetin, kaempferol), tannins, saponins, and alkaloids. These compounds contribute to its medicinal effects, particularly its wound healing and antimicrobial activities The presence of essential oils and phenolic compounds further enhances its antioxidant properties, making it a promising candidate for therapeutic applications

Das et al. 2023

Mechanistic Insights Recent research has begun to elucidate the molecular mechanisms underlying the therapeutic effects of T. procumbens. explored the pathways involved in wound healing, suggesting that compounds in T. procumbens may stimulate fibroblast activity and modulate inflammatory responses, thereby accelerating healing processes.

Nayak et al., 2022

Formulation and Delivery Systems The development of effective formulations is crucial for maximizing the therapeutic potential of T. procumbens. Various modern formulations have been investigated: Topical Ointments and Gels: formulated a herbal gel containing T. procumbens, which demonstrated enhanced wound healing efficacy in preclinical studies.

Singh et al. 2023

Nanoparticle Delivery Systems: Research into nanoparticles and microemulsions has shown promise for improving the bioavailability and targeted delivery of T. procumbens extracts

Kumar et al., 2022

Safety and Toxicity Considerations While T. procumbens has been traditionally used without significant adverse effects, safety profiles remain underresearched. Current literature calls for more comprehensive toxicological assessments, particularly regarding long-term use and potential interactions with other medications

Satpute & Balap et.al, 2024

Formulated a polyherbal gel combining Azadirachta indica and Tridax procumbens.

Patil & Samant et.al, 2023

Developed a topical polyherbal gel containing Cocculus hirsutus and Tridax procumbens.

Bhalke et.al, 2019

Formulated a topical gel incorporating aqueous extract of Tridax procumbens leaves.

Yadav et al. 2025

Developed a topical cream using ethanolic extract of Tridax procumbens leaves.

Venkatachalam & Palaniswamyet.al, 2023

Created a polyvinyl alcohol (PVA) film incorporating Tridax procumbens leaf extract.

AIM: "Screening of tridax procumbens as wound healing"

OBJECTIVES:

- To determine the effect of Tridax on wound closure rate in [specify model organism] compared to [specify control].
- To assess the impact of Tridax on key wound healing parameters, such as [specify parameters, e.g., collagen deposition, angiogenesis, inflammation] in [specify model organism].
- To compare the efficacy of Tridax to [specify control] in promoting wound healing in [specify model organism].
- To evaluate the toxicity of Tridax at different concentrations/dosages in [specify model organism].
- To assess the potential for Tridax to induce adverse effects on [specify relevant parameters, e.g., cell viability, tissue morphology] in [specify model organism].

Mechanism of Action:

• To investigate the potential mechanisms by which Tridax promotes wound healing, such as [specify potential mechanisms, e.g., stimulating cell proliferation, promoting angiogenesis, reducing inflammation] in [specify model organism].

PLAN OF WORK:



FUTURE RESEARCH DIRECTIONS OF TRIDAX PROCUMBENS

MATERIAL AND METHOD:

Material:

Ingredient	Quantity (%)	Purpose
Tridax procumbens extract	5%	Active ingredient
Carbopol 940	1%	Gelling agent
Glycerin	5%	Humectant
Propylene glycol	5%	Co-solvent, skin penetration enhancer
Methylparaben	0.2%	Preservative
Triethanolamine	q.s.	pH adjuster
Distilled Water	q.s. to 100%	Solvent

Method:

• Extraction of tridax leaves with the method of the Soxhlet apparatus and stored for further use



FIG NO 2 SOXHLET APPRATUS

Extraction Method:

Plant Collection and Authentication: Collect fresh Tridax procumbens leaves and get them authenticated by a botanist. Drying and Powdering: Wash, shade dry, and powder the leaves.

Extraction:

Use cold maceration or Soxhlet extraction with ethanol (or methanol). Filter and evaporate the solvent using a rotary evaporator. Store the extract in a cool, dry place.

BOTANICAL DESCRIPTION OF TRIDAX PROCUMBENS

Plant profile The Tridax flower is often called "Ghamra" and in English it is better known as the "Coat buttons "due to the emergence of flowers that have been widely used in the ayurvedic system of many diseases and are still being distributed to" Bhringraj "by a handful of authors who are a documented medicine for liver disease.

Plant science name: Tridax procumbens.

Common words:

- Marathi: kambermoodi, jakhamjudi, tantani.
- Hindi: Ghamra
- English: coat buttons, Tridax flower
- Sanskrit: jayantiveda

Biological Source: is found in the juice of fresh leaves of Tridax procumbens. Components used: whole plant (leaf, stem, flower, root etc.)

Kingdom	Plantae
Sub-kingdom	Tracheobionta
Division	Spermatophyte
Sub division	Magnoliophyte
Class	Magnoliopsida
Sub-class	Asteridae
Order	Asterales
Family	Araceastee
Genus	Tridax
Species	Procumbene

Table 1: Taxonomic Classification of Tridax Daisy

Pharmacological Properties of Tridax procumbens

A} Chemical Composition:

- Tridax procumbens contains a variety of bioactive compounds that contribute to its medicinal properties: -
- 1. Flavonoids: Compounds such as quercetin and kaempferol are known for their antioxidant and anti-inflammatory properties.
- 2. Tannins: These compounds have astringent properties and may aid in wound healing.
- 3. Saponins: Known for their antimicrobial and immunomodulatory effects.
- 4. Alkaloids: Some studies have identified alkaloids with potential pharmacological activities.
- 5. Essential Oils: Contribute to aroma and potential antimicrobial properties.
- 6. Phenolic Compounds: Have antioxidant properties and may help in reducing oxidative stress.

TRADITIONAL USE

- Alkaloids: Anti-inflammatory, antimicrobial, analgesic
- Flavonoids: Antioxidant, anti-inflammatory, wound-healing
- Terpenoids: Antimicrobial, anti-inflammatory Other
- compounds: Tannins, saponins.

- Bioactive Compounds and Their Potential Roles in Wound Healing
- Quercetin: Antioxidant, anti-inflammatory
- Luteolin: Antiinflammatory, antimicrobial
- β-sitosterol: Antiinflammatory, wound-healing
- Ursolic acid: Anti-inflammatory, antimicrobial, wound-healing



Pharmacological Action

Wound healing work

Liquid discharge of T. procumbens (leaves) are not only helpful in healing but also a helpful antidepressant treatment for male experimental mice. The increase in lysyl oxidase activity due to repair has been investigated to indicate wound healing function Increased nucleic acid levels indicate action at the cellular level [4] The leaf juice of Tridax procumbens was shown to suppress wound penetration in experimental animals.

Antimicrobial activity

The entire Tridax plant has reported its antimicrobial activity on a variety of bacteria. The whole plant is lightened between the palms of the hands to obtain juice. Fresh vegetable juice is used twice a day for 3-4 days to heal cuts and wounds. The whole plant Tridax extract showed antimicrobial activity against pseudomonas aeruginosa only. Disk distribution method was used to test antibacterial activity.

Antiparasite activity

Infectious diseases caused by protozoa, nematodes, trematodes, and cestodes make up more than 30% of the population and extracts of plants and their secondary metabolites may be the best way to identify these diseases.

Experimental studies on wound healing activity of tridax procumbens:

While traditional use of Tridax procumbens for wound healing exists, scientific evidence is still emerging. Here are some key experimental studies that have investigated its wound healing potential:

1. Rat Model of Excision Wound:

- Study: Wound healing activity of Tridax procumbens L. in rats by S.M.A. Rahman et al., published in the Journal of Ethnopharmacology (2012).
- Methodology: Rats with full-thickness excision wounds were treated topically with Tridax procumbens extract (5% and 10%).
- Findings: * Both extract concentrations showed significantly faster wound closure compared to control groups. * The extract accelerated wound contraction, epithelialization, and collagen deposition, indicating its potential in promoting wound healing.

2. Rat Model of Burn Wound:

- Study: Anti-inflammatory and wound healing activity of Tridax procumbens L. in rats by R.S. Kumar et al., published in the International Journal of Pharmacognosy and Phytochemical Research (2015).
- Methodology: Rats with third-degree burn wounds were treated topically with Tridax procumbens extract (10% and 20%).
- Findings: * Both extract concentrations significantly reduced wound area and increased granulation tissue formation. * They also exhibited anti-inflammatory effects by reducing redness and edema in the burn wound.

3. In Vitro Studies:

- Study: In vitro study of the wound healing potential of Tridax procumbens L. extract by A.S. Patil et al., published in the International Journal of Pharmaceutical Sciences and Research (2016).
- Methodology: The study investigated the effect of Tridax procumbens extract on fibroblast proliferation and collagen synthesis in vitro.

• Findings: * The extract significantly increased fibroblast proliferation and collagen production in a dose-dependent manner. * This suggests that Tridax procumbens may promote wound healing by stimulating fibroblast activity.

4. Other studies:

 There are other preclinical studies on the wound healing activity of Tridax procumbens, including investigations on its antioxidant and antibacterial properties, which also contribute to its wound healing potential.

Wound healing activity

Traditionally, the juice from leaves of T. procumbens has been used for healing dermal wounds. Wound healing process involves three phases namely inflammation, angiogenesis and collagen deposition. In an excision and incision wound model in Wistar rats, both aqueous and ethanolic extracts of T. procumbens increased the tensile strength of the wound compared to control rats. Further, wound healing biomarkers such as hydroxyproline, collagen and hexosamine were significantly increased {2}.

The wound healing ability was also confirmed by topical ointment formulation of the leaf extract of T. procumbens in a mouse model, where dosedependent improvement of cell proliferation and wound remodelling was observed $\{3\}$.

Lysyl oxidases (LOX) are a group of enzymes catalyzing cross-linking reaction of collagen and elastin to form covalently linked, insolubilize extracellular matrix (ECM) proteins thereby facilitating ECM stabilization through ECM formation, development, maturation and remodelling {4}

The increased lysyl oxidase activity on treatment with T. procumbens extract in rat wound healing model suggests their role in wound healing {5}.

In C. elegans wound model and cell lines scratch wound healing assay, the wound healing ability of T. procumbens and its phytocompounds Octa decenoic acid (ODA), Pyridine carboxamide oxime, known as Nicotinamide (NA) and Dimethyl Benz[c]acridine (DMB) were studied. Results indicated that the wound healing ability was mainly contributed by NA in the chloromethyl nicotinamide derivative form by interacting with the wound healing biomarker, glycogen synthase kinase 3 (GSK-3) {6}.

Formulations and Delivery Systems for Tridax procumbens in Wound Healing

While research on the therapeutic potential of Tridax procumbens for wound healing is promising, developing effective and safe formulations for its delivery is crucial. Here's an overview of existing and potential formulations:

- 1. Traditional Formulations:
 - Topical Applications: Traditional use of Tridax procumbens for wound healing often involves applying crushed leaves, decoctions, or poultices directly to the wound.
 - Decoctions: Boiling the plant material in water and applying the extract topically is a common practice in some regions.

2. Modern Formulations:

- Extracts: Ethanol, methanol, or water extracts of Tridax procumbens are commonly used in research.
- Ointments: Tridax procumbens extracts can be incorporated into ointment bases like petroleum jelly or lanolin for topical application.
- Creams: Cream formulations using Tridax procumbens extract in a water-based emulsion could offer better absorption and spreadability.
- Gels: Hydrogels containing Tridax procumbens extract can be used for wound dressing, promoting moist wound healing and allowing for controlled release of the active compound.

3. Delivery Systems:

- Nanoparticles: Encapsulating Tridax procumbens extract within nanoparticles can improve its bioavailability, controlled release, and targeted delivery to the wound site.
- Microemulsions: Microemulsions can enhance penetration and absorption of the extract, leading to better therapeutic efficacy.
- Hydrogels: Hydrogels provide a moist environment for wound healing and can incorporate Tridax procumbens extract for sustained release.
- Films: Thin films containing Tridax procumbens extract can be applied directly to the wound site, offering controlled release and protection.

4. Future Research:

- Optimizing Extraction Methods: Researching optimized extraction methods for Tridax procumbens can ensure maximum yield of active compounds and enhance their stability.
- Nanotechnology Applications: Further exploration of nanoparticles, liposomes, and other nanocarriers can improve targeted delivery and control the release of Tridax procumbens extract.
- Biocompatibility and Safety: Thorough investigation of the biocompatibility and safety of different formulations and delivery systems is crucial for clinical application.



FIG: 4



Evalution test

1. Physical Appearance

Purpose: To ensure the product is aesthetically acceptable and uniform. Procedure: Visually inspect the gel for color (should be consistent with the plant extract, usually light green to dark green), odor (mild herbal scent without foul smell), and homogeneity (absence of lumps, bubbles, or phase separation). Check the gel under normal and white light.

Store for 24 hours and recheck for consistency or phase separation.

2. pH Determination

Purpose: To ensure the gel is skin-compatible and will not cause irritation. Apparatus: Digital pH meter (previously calibrated with buffer solutions of pH 4, 7, and 10). Procedure:Weigh about 1 gram of the gel and disperse in 10 mL of distilled water. Stir gently to form a uniform solution. Insert the electrode into the sample. Record the pH reading.

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3. Viscosity

Purpose: To determine the gel's resistance to flow, which affects spreadability, application, and drug release.Apparatus: Brookfield Viscometer with spindle number (usually spindle 64 for gels).Procedure:Fill a beaker with the gel sample.Place it under the viscometer so that the spindle is fully immersed.Set the viscometer to the desired rpm (typically 10, 20, and 50 rpm for comparison).

Record the viscosity in centipoise (cP) at each rpm.

4. Antimicrobial Activity

Use agar well diffusion method against bacteria like Staphylococcus aureus and E. coli.

5. Skin Irritation Test

Perform on a small area of human skin or using an animal model under ethical approval

A REVIEW OF THE SAFETY AND TOXICITY OF TRIDAX PROCUMBENS :

Tridax procumbens, commonly known as "coat buttons" or "tridax daisy," is a widely distributed plant in tropical and subtropical regions. It has a long history of use in traditional medicine for various ailments, including wound healing, anti-inflammatory, and antimicrobial purposes. However, scientific evidence regarding its safety and toxicity remains limited, and more research is needed to establish its safety for human consumption.

Safety Concerns and Toxicity:

While traditionally used, Tridax procumbens safety and toxicity profile remains incompletely understood. Here are some key concerns:

- Limited Human Studies: Most studies on *Tridax procumbens* are based on animal models or in vitro experiments. More research is needed to assess its safety and efficacy in humans.
- Potential Allergic Reactions: Tridax procumbens may cause allergic reactions in some individuals, leading to skin rashes, itching, or even more severe symptoms.
- Interactions with Medications: Tridax procumbens may interact with certain medications, especially those that affect the liver or blood clotting.
- Dosage Uncertainty: The safe and effective dosage for *Tridax procumbens* is not established. Taking too much can potentially lead to adverse effects.
- Contamination Risk: Plants used in traditional medicine may be contaminated with pesticides, heavy metals, or other harmful substances, particularly if grown in polluted areas.

Toxicity Profile: Limited Adverse Effects Reported

- Animal studies: Generally well-tolerated at therapeutic doses
- Limited human data: Traditional use suggests good safety, but more data needed
- Safety Considerations for Topical and Oral Administration
- Topical administration: Generally safe, but individual sensitivity possible
- Oral administration: Further research needed on safe dosage and potential interactions
- Need for Further Toxicological Studies
- Long-term toxicity studies: Assessing potential cumulative effects
- Genotoxicity and carcinogenicity studies: Investigating potential risks
- Drug interaction studies: Investigating potential interactions with medications

FUTURE RESEARCH DIRECTIONS OF TRIDAX PROCUMBENS:

Bioactive Compounds and Mechanisms of Action:

- Isolation and characterization of novel bioactive compounds with antioxidant, antiinflammatory, and antibacterial properties.
- Elucidation of the molecular mechanisms underlying the pharmacological effects of Tridax procumbens extracts and compounds.
- Investigation of the interactions between bioactive compounds and cellular targets.

Pharmacological Applications:

- Evaluation of the efficacy of Tridax procumbens in animal models of chronic diseases, such as diabetes, cancer, and cardiovascular disorders.
- Investigation of the potential of Tridax procumbens as a complementary or alternative therapy for conventional treatments.
- Development of standardized formulations and dosage regimens for clinical use.

Clinical Trials:

- Conduct randomized controlled trials to assess the safety and efficacy of Tridax procumbens extracts or compounds in humans.
- Determine the appropriate dosage and duration of treatment for various health conditions.
- Monitor long-term outcomes and adverse effects.

Cultivation and Sustainable Harvesting:

- Optimization of cultivation techniques to increase biomass production and active compound yield.
- Development of sustainable harvesting practices to prevent overexploitation of wild populations.
- Exploration of alternative sources, such as tissue culture or bioreactor systems.

Ethnobotanical Studies:

- Documentation of traditional uses and cultural significance of Tridax procumbens in different regions.
- Identification of indigenous knowledge and practices related to its preparation and administration.
- Collaboration with local communities to enhance conservation efforts.

Toxicity and Safety Assessments:

- Comprehensive evaluation of the toxicity, genotoxicity, and potential interactions of Tridax procumbens extracts or compounds.
- Determination of safe dosage ranges and contraindications for human use.

Other Areas:

- Investigation of the antimicrobial activity against multidrug-resistant microorganisms.
- Study of the immunomodulatory effects and potential for immune-enhancing applications.
- Exploration of the use of Tridax procumbens in veterinary medicine and as a feed supplement.

RESULT

Sr. No.	Physical Test	Observation of formulated Product	Observation of Marketed Product
1	Colour	Green	translucent
2	PH	6.9	6.5
3	Appearance	Gel	Gel
4	Texture	Easily Applied	Easily Applied
5	Odour	Mild	Mild
6	Spredability	Easily spreability	Easily spreability
7	Grittiness	No	No
8	Homogeneity	Homogenous	Homogenous
9	Irritancy	Non Irritant	Non Irritant

CONCLUSION:

Wounds are physical injuries that lead to the opening or cracking of the skin. Proper healing of wounds is essential to restoring the disrupted anatomical continuity and functional disruption of several cell types in injury. Reconstructive wounds repair is accompanied by a systematic and unexplained sequence of biological events that begin with wound closure and proceed to repair and repair of damaged tissue.

This review attempts to focus on the benefits and why it is necessary to continue researching plants that are known to be used in traditional medicine that could lead to the discovery and development of new common medicines.

Tridax daisy has a long history of traditional use but the isolation and testing of each phytochemical has not been properly associated with its medicinal properties and may indicate difficulty in reproduction after separation and testing. Various drugs are used to classify metabolites and to treat various diseases.

Research on the Tridax daisy plant also stimulates the development of novel therapeutic agents from a variety of compounds with different pharmacological properties. Therefore, there is a great deal of research focused on other activities of herbal medicine and clarifying how to do the same in the future.

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