

## EXPLORING BIOHERBAL POLYMERIC DRESSINGS FOR ENHANCED DIABETIC WOUND HEALING: EMPHASIS ON *CATHARANTHUS ROSEUS*

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### ABSTRACT

Diabetic wound healing continues to be a significant therapeutic hurdle because of extended inflammation, oxidative stress, insufficient tissue regeneration, and a heightened vulnerability to infection. Traditional wound dressings primarily act as protective barriers and frequently do not effectively aid the complex biological processes essential for proper healing under diabetic conditions. In recent years, bioherbal polymeric dressings have surfaced as a promising strategy by combining medicinal plant extracts with biocompatible polymer systems. This review investigates the potential of these dressings to improve diabetic wound healing, focusing particularly on *Catharanthus roseus*. This plant is historically recognized for its antidiabetic, antioxidant, and

wound-healing properties, making it an ideal candidate for treatment in diabetic wounds. The review also addresses the beneficial role of *Curcuma longa*, especially in managing inflammation and the microbial load typically associated with chronic diabetic wounds. Additionally, the importance of chitosan–alginate polymeric systems is emphasized by their biocompatibility, moisture-retaining properties, and ability to deliver herbal bioactives in a controlled manner. Instead of presenting experimental results, this article delivers a conceptual and evidence-based overview of how the integration of selected bioherbs with polymeric dressings could provide a multifunctional approach to diabetic wound management. By merging insights from disease understanding, plant-based treatments, and

polymer science, this review presents a clear and practical viewpoint for future research and advancement in diabetic wound care.

**KEYWORDS:** Diabetic wound healing; Bioherbal dressings; *Catharanthus roseus*; *Curcuma longa*; Chitosan–alginate; Polymeric wound dressings.

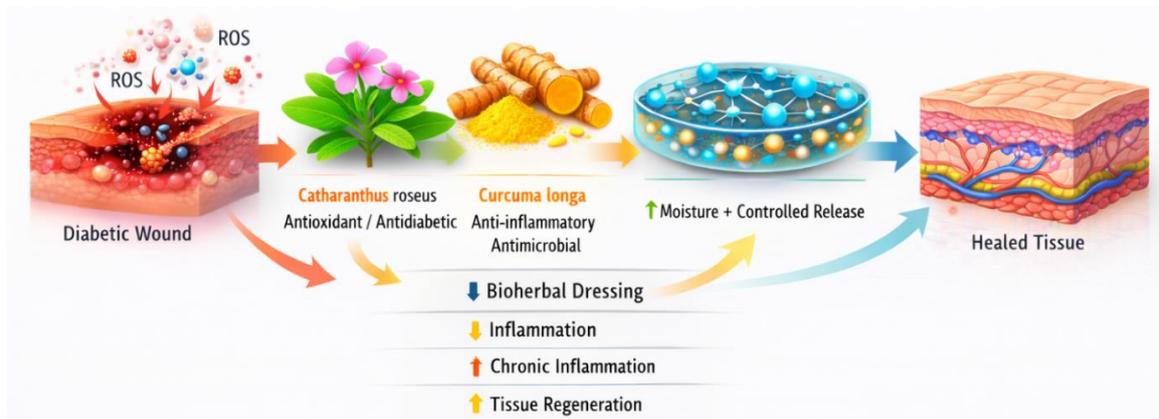
## 1. INTRODUCTION

Diabetes mellitus is a long-term metabolic condition that impacts millions globally and is frequently linked with chronic complications. Among these complications, diabetic wounds, particularly diabetic foot ulcers, are regarded as some of the most severe and challenging conditions to manage. These wounds heal slowly, are susceptible to infections, and can lead to grave outcomes like tissue death or amputation of limbs if not appropriately treated.

The slow healing observed in diabetic wounds can be attributed to multiple factors rather than a single reason. This healing delay stems from a mix of issues, including ongoing inflammation, oxidative stress, diminished blood circulation, hindered collagen synthesis, and a heightened presence of bacteria. Traditional wound dressings, while effective for providing protection and absorbing exudate, typically function as passive materials and do not actively aid the biological processes necessary for tissue repair under diabetic conditions.

Recently, there has been a growing focus on bioactive wound dressings that can engage actively in the healing process. In this regard, bioherbal polymeric dressings have attracted significant interest. These innovative systems merge the healing properties of medicinal plants with the beneficial characteristics of natural polymers. Medicinal plants contribute antioxidant, anti-inflammatory, and antimicrobial effects, while polymers offer structural support, moisture retention, and a controlled release of bioactive compounds.

This review centers on a developing and practical strategy in managing diabetic wounds—bioherbal polymeric dressings, with a specific focus on *Catharanthus roseus*. The objective of this article is to explore the background of the disease, the contribution of chosen medicinal plants, their bioactive elements, and the significance of polymeric systems like chitosan–alginate in the creation of effective wound dressings. Through an integrated and concept-driven overview, this review underscores a promising path to enhance healing in diabetic wounds.



**Figure 1.1: Conceptual illustration of bioherbal polymeric dressing in diabetic wound healing using *Catharanthus roseus* and *Curcuma longa*.**

## 2. HEALING CHALLENGES OF DIABETIC WOUNDS: BACKGROUND ON THE DISEASE

Diabetic wounds arise from chronic metabolic imbalances and impaired physiological responses linked to diabetes mellitus. Unlike regular wounds that follow a structured healing process, diabetic wounds frequently become stuck in a state of delayed or non-healing. This characteristic renders them chronic and challenging to treat.

### Differences Between Diabetic Wounds and Normal Wounds

In healthy individuals, wound healing progresses through four coordinated stages: hemostasis, inflammation, proliferation, and remodeling. In individuals with diabetes, this process is disrupted.

#### The primary distinctions include

- An extended and excessive inflammatory phase
- Diminished movement of fibroblasts and keratinocytes
- Impaired development of new blood vessels (angiogenesis)
- Inadequate collagen formation and slow wound contraction
- Heightened risk of bacterial colonization and infection
- Underlying Factors Contributing to Pathology

Multiple interrelated elements lead to inefficient wound healing in diabetes.

### 1. Hyperglycemia

Elevated blood sugar levels enhance oxidative stress and damage cellular proteins, hindering tissue repair.

## 2. Oxidative stress

An abundance of free radicals disrupts cell function and prolongs inflammation at the wound site.

## 3. Poor circulation

Decreased blood flow restricts the delivery of oxygen and nutrients essential for healing.

## 4. Neuropathy

Loss of sensation can delay both the identification of wounds and the initiation of appropriate treatment.

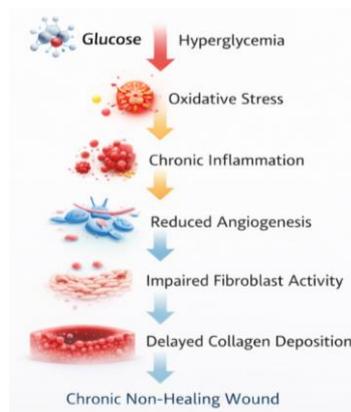
## 5. Increased susceptibility to infection

A compromised immune system makes diabetic wounds more vulnerable to frequent infections.

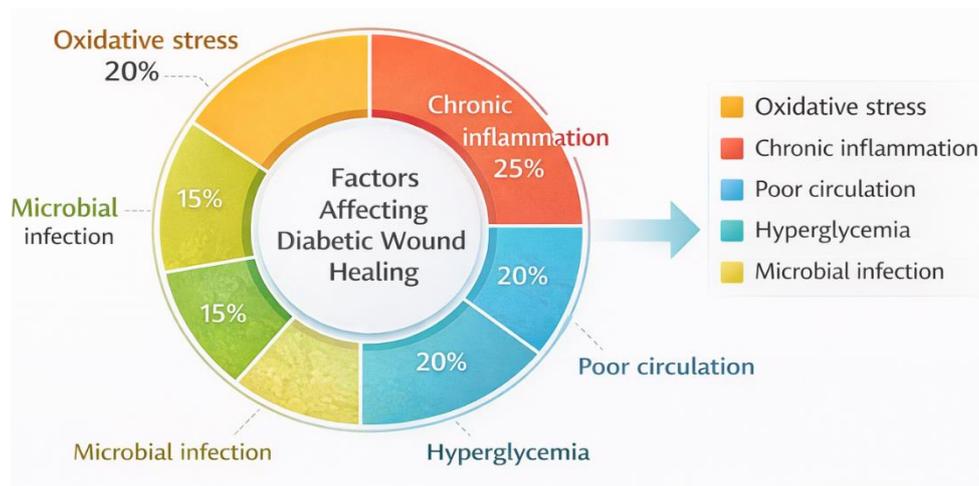
### Importance of the Issue

Chronic diabetic wounds greatly diminish patient quality of life and escalate healthcare expenses. The necessity for repeated dressing changes, extended healing periods, and recurrent infections emphasizes the limitations of traditional wound care methods. These issues underline the urgent need for multifunctional wound management strategies that extend beyond mere wound coverage.

Gaining insight into these disease-related obstacles serves as the groundwork for investigating alternative methods, such as bioherbal polymeric dressings, that aim to address numerous healing impediments simultaneously.



**Figure 1.2:** Flowchart showing the pathophysiology of diabetic wound healing impairment.



**Figure 1.3: Pie chart showing the major factors affecting diabetic wound healing.**

### **3. CHOICE OF MEDICINAL PLANT: CATHARANTHUS ROSEUS AND ITS IMPORTANCE**

Among the many medicinal plants investigated for their potential in wound healing, *Catharanthus roseus* has gained significant attention due to its extensive pharmacological properties and its historical use in treating metabolic and skin-related issues. The inclusion of this plant in the current review is primarily due to its significance in diabetic conditions, rather than merely its general claims related to wound healing.

#### **General description of the plant**

*Catharanthus roseus*, often referred to as Madagascar periwinkle or *Nithya Kalyani*, is a flowering species that belongs to the Apocynaceae family. Various parts of the plant, particularly its leaves and flowers, have been traditionally utilized in herbal medicine for the management of diabetes, infections, and skin problems.

#### **Reasons for the relevance of *Catharanthus roseus* in diabetic wounds**

The efficacy of *C. roseus* in promoting healing of diabetic wounds stems from its impact on several factors associated with impaired healing.

#### **Antidiabetic properties**

Research indicates that the plant can aid in lowering blood sugar levels in preclinical tests, which may subsequently enhance the wound environment under diabetic conditions.

### Antioxidant Properties

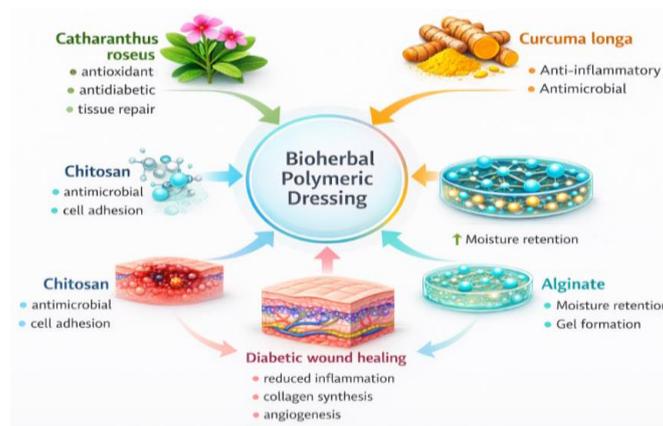
The bioactive components of the plant help neutralize excess free radicals, thereby alleviating oxidative stress at the wound site.

### Assistance in tissue repair

By shielding cells from oxidative harm and promoting healthy cellular functions, the plant plays a role in the gradual and regulated regeneration of tissue.

### Antimicrobial properties

Certain elements within *C. roseus* demonstrate effectiveness against prevalent wound pathogens, contributing to a decrease in the likelihood of infections.



**Figure 1.4: Components of bioherbal polymeric dressing and their role in diabetic wound healing.**

## 4. BIOACTIVE COMPONENTS OF CATHARANTHUS ROSEUS AND THEIR FUNCTIONAL ROLE

The medicinal benefits of *Catharanthus roseus* mainly come from various bioactive compounds that work together instead of depending on just one active ingredient. Identifying these components helps explain the plant's importance in healing diabetic wounds.

### Key categories of bioactive components

Instead of focusing on complex chemical names, we can generally categorize the essential functional groups as follows.

#### 1) Indole alkaloids

These compounds are the signature of *C. roseus*. They influence cellular activity and metabolic balance, which is vital in diabetic conditions.

## 2) Flavonoids

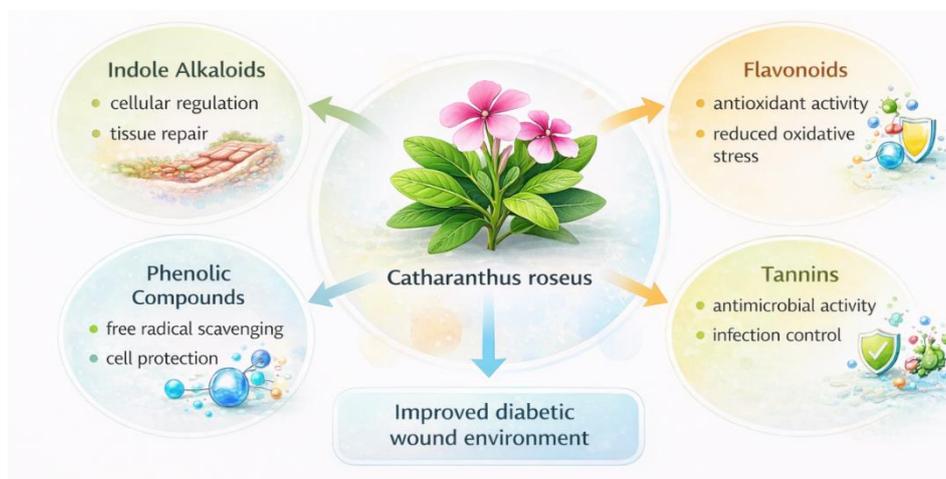
Flavonoids serve as natural antioxidants that help reduce oxidative stress at the wound site.

## 3) Phenolic compounds

These compounds strengthen antioxidant defenses and protect skin cells from damage.

## 4) Tannins

Tannins provide mild antimicrobial and astringent effects, which are useful in treating wound infections and fluid buildup.



**Figure 1.5: Bioactive components of *Catharanthus roseus* and their role in improving the diabetic wound environment.**

## 5. THE FUNCTION OF CURCUMA LONGA AS AN ADJUNCT HERBAL COMPONENT IN HEALING DIABETIC WOUNDS

In addition to the primary plant, *Catharanthus roseus*, having a complementary herbal agent is beneficial for addressing obstacles in the healing of diabetic wounds. In this regard, *Curcuma longa* (turmeric) is regarded as an appropriate supportive plant due to its well-established anti-inflammatory and protective attributes.

Diabetic wounds often present with.

- Chronic inflammation
- Frequent microbial infections
- Delayed progression from inflammation to tissue repair

While *Catharanthus roseus* primarily contributes by enhancing the wound environment and metabolic equilibrium, an additional plant that can manage inflammation and surface infections bolsters the overall healing strategy.

### **The therapeutic significance of *Curcuma longa***

Curcumin, the principal bioactive compound in turmeric, is renowned for its extensive biological functions. From the perspective of wound healing, turmeric aids in the following ways.

#### **Regulation of inflammation**

Aids in mitigating the prolonged inflammatory response, which significantly hinders the healing process in diabetic wounds.

#### **Antioxidant support**

Helps decrease oxidative stress at the wound site, thereby safeguarding newly developed tissue.

#### **Antimicrobial assistance**

This contributes to limiting microbial proliferation and surface contamination of chronic wounds.

In the context of a review, *Curcuma longa* functions as a practical and evidence-backed herbal ally that complements the wound-supportive functions of *Catharanthus roseus*.

#### **Functional relevance in diabetic wound healing**

- The components of *C. roseus* help healing gradually and in a balanced way:
- Reduce oxidative stress that slows diabetes healing.
- Protect fibroblasts and keratinocytes from harm.
- Create a healthier environment for the wound.
- Help control microbial growth.

#### **Importance of component-level understanding**

- Highlighting the bioactive components:
- Connects traditional uses with scientific explanations.
- It shows how one plant can address several wound-related problems.
- Supports the idea of combining the plant with polymers for controlled and targeted effects.

- Understanding these components provides a solid reason to include *Catharanthus roseus* in bio herbal polymer dressings for managing diabetic wounds.

### Fostering a supportive healing environment

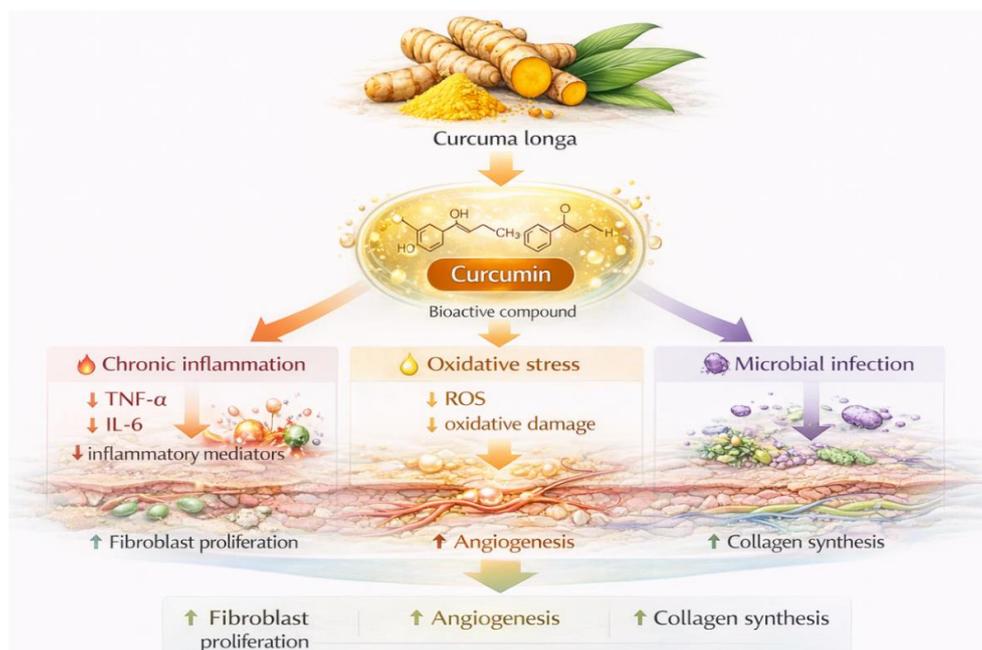
By alleviating irritation and inflammation, turmeric facilitates a smoother transition of the wound into the healing phase.

Rationale for turmeric's inclusion in a review-based combination

Turmeric has been extensively researched and is broadly recognized for topical applications, establishing it as a reliable complementary component in a conceptual bioherbal framework. Its integration.

- Enhances the scientific justification of the combination
- Balances the healing process by managing inflammation
- Provides credibility without overcomplicating the formulation concept

In the context of a review, *Curcuma longa* functions as a practical and evidence-backed herbal ally that complements the wound-supportive functions of *Catharanthus roseus*.



**Figure 1.6: Mechanism of curcumin (*Curcuma longa*) in diabetic wound healing through reduction of inflammation, oxidative stress, and microbial infection, leading to tissue regeneration.**

## 6. CHITOSAN-ALGINATE POLYMERIC SYSTEM AS A CARRIER FOR HERBAL BIO-DRESSINGS

The effectiveness of any herbal bio-dressing largely depends on its carrier system. Applying plant extracts directly to wounds can lead to poor retention, instability, and uneven therapeutic effects.

To tackle these issues, polymeric systems like chitosan and alginate often come up in wound-care discussions.

### The need for polymers in wound dressings

Polymeric carriers do more than just provide support; they also help with the healing process. For diabetic wounds, an ideal polymeric system should:

- Maintain a moist environment for the wound.
- Absorb excess fluid from the wound.
- Protect the wound from outside contaminants.
- Allow for targeted and controlled release of bioactive components.

Chitosan and alginate meet many of these needs, making them popular options for wound-dressing applications.

### The role of chitosan

Chitosan, a natural polymer made from chitin, is known for its beneficial properties in wound care.

### Key functions of chitosan include

- Mild antimicrobial properties that help reduce surface infections
- Support in blood clotting and early stabilization of wounds
- Promotion of cell adhesion and movement at the wound site

These features make chitosan especially helpful during the early stages of wound healing.

### The role of alginate

Alginate, a natural polysaccharide from seaweed, is widely used in wound-care products.

Its main properties include.

- High fluid absorption capacity, useful for exuding wounds
- The ability to form a soft gel when it interacts with wound fluid
- Keeping a moist environment that supports tissue repair

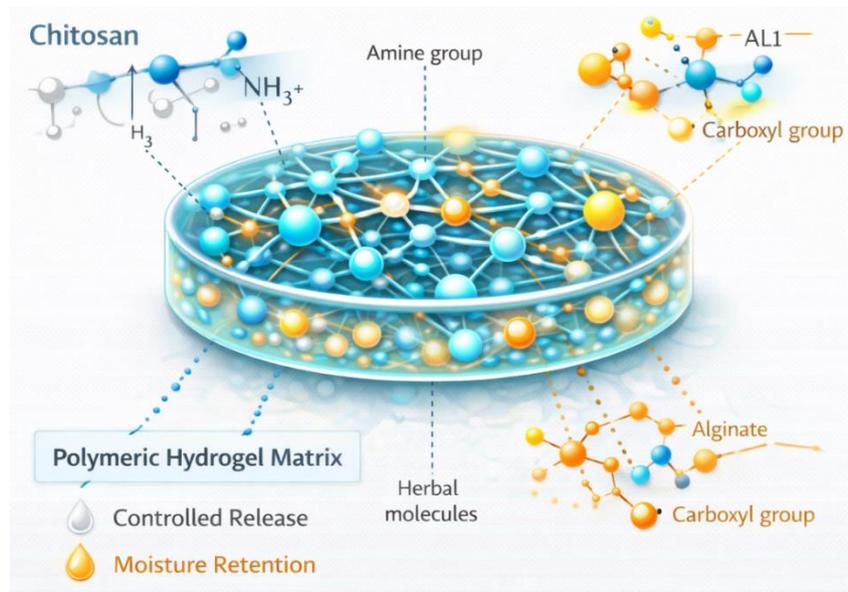
Alginate-based dressings are particularly beneficial for chronic and diabetic wounds, where managing fluid is important.

### The reason for combining chitosan and alginate

Combining chitosan and alginate creates a synergistic polymeric system. Their partnership offers.

- Greater mechanical strength
- Better moisture retention
- Improved control over the release of herbal bioactive compounds

From a review perspective, the chitosan-alginate system provides a clear and widely accepted method for delivering herbal extracts like *Catharanthus roseus* and *Curcuma longa* for healing diabetic wounds.



**Figure 1.7: Structure of chitosan–alginate polymeric hydrogel matrix used for controlled release and moisture retention in bioherbal wound dressing.**

## 7. CONCEPTUAL INTEGRATION OF BIOHERBAL COMPONENTS WITHIN CHITOSAN–ALGINATE DRESSINGS

In a review-based approach, it is important to clearly explain how selected herbs and polymers can work together, without claiming experimental formulation or results. This section presents a conceptual integration model showing how bioherbal components may be incorporated into a chitosan–alginate dressing to support diabetic wound healing.

Conceptual design of bioherbal dressing

The proposed system involves three key elements.

- Bioherbal actives from *Catharanthus roseus* are the primary component
- Supportive herbal component from *Curcuma longa*
- Chitosan–alginate polymeric matrix as the carrier system

#### **In this conceptual model**

- *Catharanthus roseus* is considered the main contributor to improving the wound environment under diabetic conditions.
- *Curcuma longa* plays a supportive role by helping control inflammation and surface microbial growth.
- The polymeric matrix ensures retention, protection, and gradual availability of herbal constituents at the wound site.

#### **How the system may function at the wound site**

Rather than acting through a single mechanism, the integrated system may support healing through multiple pathways.

- The polymeric dressing maintains moisture and protects the wound surface.
- Herbal components gradually interact with the wound environment.
- Oxidative stress and prolonged inflammation are reduced.
- Conditions become more favorable for normal tissue repair and regeneration.

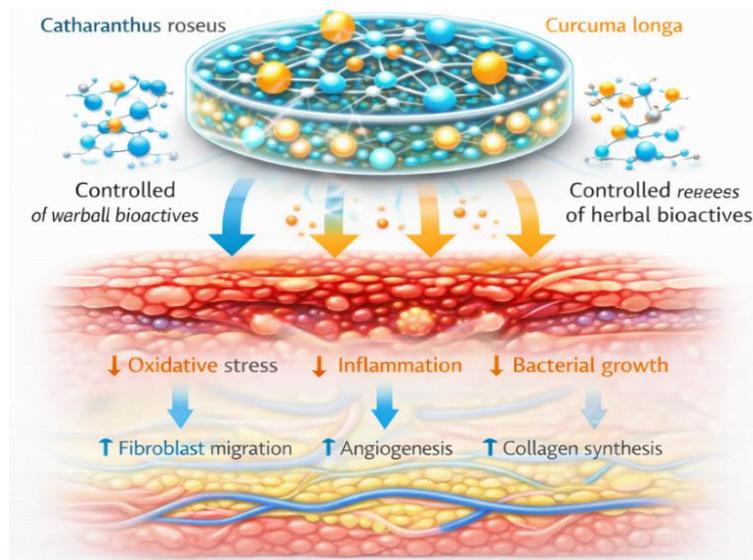
#### **Advantages of a conceptual combination**

- This integration offers several review-relevant advantages:
- Avoids aggressive or uncontrolled delivery of herbal extracts
- Supports localized action with minimal systemic exposure
- Addresses multiple challenges of diabetic wound healing in a balanced manner

Why does this integration suit a review article?

- It is conceptual, not experimental
- It is based on existing pharmacological and polymer science knowledge
- It allows future researchers to explore formulation optimization and validation

By presenting this integrated model, the review highlights a rational and innovative direction for developing bioherbal polymeric dressings aimed at improving diabetic wound healing outcomes.



**Figure 1.8: Mechanism of bioherbal polymeric hydrogel dressing showing controlled release of *Catharanthus roseus* and *Curcuma longa* bioactives for diabetic wound healing.**

## 8. COMPARISON WITH OTHER HERBAL-BASED WOUND DRESSING APPROACHES

Many medicinal plants have been studied for their potential in wound healing. Numerous herbal-based dressings are discussed in the literature. However, many of these methods focus on general wound healing rather than the unique challenges of diabetic wounds. Evaluating the current bioherbal approach alongside existing herbal methods highlights its importance and originality.

### Commonly reviewed herbal wound dressings

Several plants frequently appear in wound-care literature.

#### 1) Aloe vera

Known for its soothing and hydrating properties, Aloe-based dressings support epithelialization but show limited effectiveness against the severe oxidative stress and chronic inflammation found in diabetic wounds.

#### 2) Centella asiatica

This plant is well researched for its role in collagen production and tissue regeneration. While effective, its use has been mainly examined in non-diabetic wound models.

### 3) *Azadirachta indica* (Neem)

Valued for its antimicrobial properties, its strong biological effects can sometimes cause irritation, which points to the need for careful delivery.

### 4) Honey and honey-based dressings

These are effective in controlling infections; however, the variability in their composition and quality remains a concern.

### How the present bioherbal concept differs

The focus on *Catharanthus roseus* offers a fresh perspective. Instead of just addressing surface healing, this plant is selected for its antidiabetic and antioxidant properties, which indirectly improve the wound environment. The strategic inclusion of *Curcuma longa* aims to tackle inflammation and microbial load, two major barriers to recovering from diabetic wounds.

### Key distinguishing points include

- A focus on the specific challenges of diabetic wounds rather than typical wounds.
- Use of a polymeric carrier system to improve stability and localized availability.
- A balanced and well-planned combination instead of complex or aggressive polyherbal mixtures.

### Why this comparison matters in a review

From the perspective of a review article.

- It highlights the weaknesses in current herbal dressing techniques.
- It supports the selection of *Catharanthus roseus* as a lesser-explored alternative.
- It presents the chitosan-alginate bioherbal system as a sensible next step rather than repeating familiar strategies.

This comparison stresses the need for exploring new herbal-polymer combinations that work better with the complex nature of diabetic wound healing.

Plant Source	Main Activity	Limitation	Improvement in Proposed System
 <b>Aloe vera</b>	 Strength and intireation	 Loss wound controls	 Deathro flow advantage
 <b>Centella asiatica</b>	 Strength and dianseling	 Limitation treatments	 Deathro lover wound alliratens
 <b>Neem</b>	 Health and treatments	 Continent controls	 Cnocimbent in and health business
 <b>Honey</b>	 Honey dipper and honey	 No important strains	 Improvement in antirintication imposed
 <b>Catharanthus roseus + Curcuma longa (proposed)</b>	 Healti and moliation	 Slaked capacity Limitations	 Increases tamdrentunal advantages

**Figure 1.9: Comparative analysis of different herbal treatments and the proposed bioherbal system for diabetic wound healing.**

## 9. FUTURE SCOPE AND RESEARCH PERSPECTIVES

Bioherbal polymeric dressings have potential for managing diabetic wounds, but several areas need more research before these systems can be regularly used. This article is a review, so the following points focus on future directions instead of the experimental claims' scope for future research.

### 1) Preclinical validation

In vivo studies using diabetic wound models can help confirm the wound-supporting role of *Catharanthus roseus*-based polymeric dressings.

### 2) Optimization of herbal combinations

Further studies can explore the best ratios of *Catharanthus roseus* and *Curcuma longa* to balance antioxidant, anti-inflammatory, and healing effects.

### 3) Polymer modification

Changing the chitosan-alginate composition may improve flexibility, absorption capacity, and duration of action.

#### 4) Safety and stability evaluation

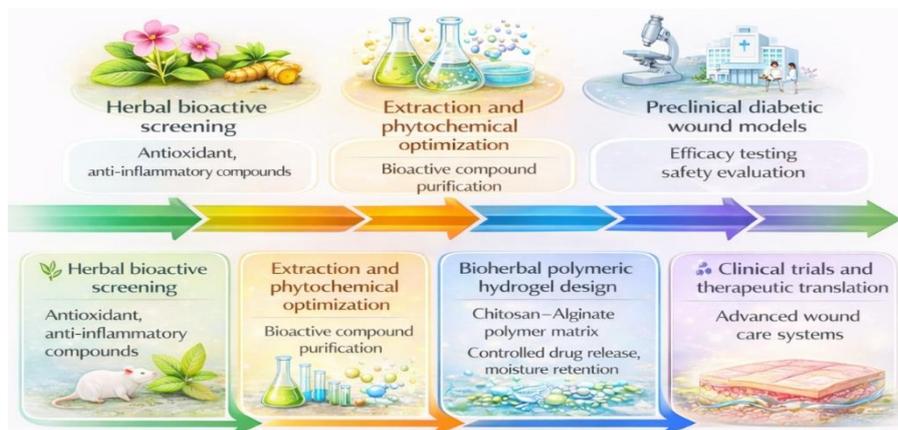
Long-term stability, skin compatibility, and irritation studies are needed to ensure patient safety.

#### 5) Relevance of future development

Advancing this concept may lead to.

- Development of cost-effective wound dressings
- Reduced reliance on topical antibiotics
- Better management of chronic diabetic wounds
- Sustainable use of natural and biodegradable materials

From a broader perspective, bioherbal polymeric dressings fit well with the current need for safer, eco-friendly, and patient-friendly wound care solutions.



**Figure 1.10: Future research roadmap for the development of bioherbal polymeric dressings in diabetic wound healing.**

## 10. RESULTS AND DISCUSSION

Even though this paper is theoretical and does not include experimental data, it brings together current pharmacological and biomaterial data. This demonstrates a few crucial facts about using a combination of chitosan-alginate polymer systems, *Catharanthus roseus*, and *Curcuma longa* to treat wounds caused by diabetes. The literature suggests that the efficacy of this method is derived from the interplay between metabolic support, inflammation regulation, and biomaterial-assisted delivery, as opposed to analyzing each component individually.

Rethinking the Significance of *Catharanthus roseus* in Wound Treatment

The primary focus of pharmacological debates on *Catharanthus roseus* is on its anticancer alkaloids, such as vinblastine and vincristine. Nevertheless, studies on metabolic illnesses and tissue repair suggest that this plant may play an underestimated role in treating diabetic wounds.

According to experimental data, *C. roseus* extracts may aid in.

- maintaining oxidative balance in diabetic tissue
- safeguarding the cells involved in tissue repair
- enhancing metabolic circumstances that have an indirect impact on wound healing

The fact that *C. roseus* supports wound healing suggests that it has more value than simply that. The plant seems to aid in reestablishing a biological environment that facilitates better healing. In wound care research, there wasn't much focus on this viewpoint.

Using *Curcuma longa* as a regulatory, not a main, healing agent

This framework now has an additional layer of therapeutic balance thanks to the inclusion of *Curcuma longa*. The primary ingredient in turmeric, curcumin, has been extensively researched for its anti-inflammatory and antioxidant effects. Regarding the treatment of diabetic wounds, though, its significance may lie more in controlling the inflammatory environment around the wound than in directly regenerating it.

Wounds caused by diabetes tend to remain trapped in an extended inflammatory stage. Curcumin has been shown in studies to be able to modulate inflammatory signaling pathways and lessen excessive oxidative stress. Turmeric may facilitate the shift from inflammation to tissue regeneration by targeting these biological disruptions.

*Curcuma longa* is therefore not the main treatment in the recommended bioherbal system. Rather, it serves as a regulatory element that maintains the wound environment in a stable condition, facilitating the efficient functioning of other regenerative processes.

The significance of polymeric matrices in interpreting herbal activity

Because medicinal plants readily diffuse, degrade, or are poorly retained at the site of application, their direct application to wounds frequently produces inconsistent results, despite their valuable biological characteristics. A key step in transforming conventional remedies into useful biomedical materials is the utilization of herbal extracts in polymeric systems such as chitosan-alginate matrices.

Polymeric wound dressings made of chitosan-alginate have been demonstrated in studies to offer numerous advantages.

- Keep the wound hydrated.
- taking up extra exudate
- physically shielding delicate tissue
- managing the release of therapeutic substances

Here, the polymeric matrix functions as a biologically interactive platform that affects the release of herbal bioactives at the wound site in addition to acting as a structural covering.

Synergistic explanation of the combined bioherbal dressing.

A compelling therapeutic pattern emerges when considering the selected plants' pharmacological characteristics in conjunction with the polymeric carrier's functions. The suggested mechanism treats diabetic wound pathology using three linked pathways.

- *Catharanthus roseus* provides metabolic and antioxidant assistance.
- Microbial control and inflammation regulation via *Curcuma longa*
- The chitosan-alginate matrix facilitates targeted and continuous administration.

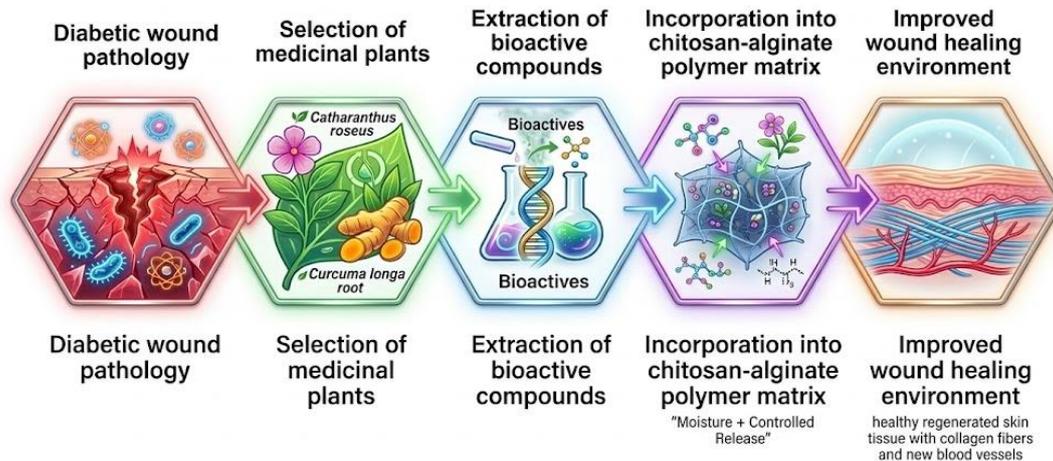
The suggested dressing focuses on gradually stabilizing the wound environment rather than serving as a fast stimulant for rapid tissue development. New concepts in chronic wound research support this perspective, which holds that biological balance restoration may be preferable to promoting rapid tissue expansion.

An innovative approach to treating diabetic wounds

According to the combined insights from available studies, the application of polymeric biomaterials and bioactive plants could represent a significant change in the way wounds are treated. Polymer science gives the structural accuracy necessary for regulated therapeutic delivery, while traditional herbal treatments offer biological variety.

Taking a step back, this idea framework emphasizes a shift in wound care from symptom-focused therapy to methods that prioritize the healing environment. Bioherbal polymeric dressings may offer a more complete method of treating diabetic wounds by simultaneously targeting oxidative stress, inflammation, microbial load, and tissue hydration.

In general, the literature indicates that research into polymer wound dressings made from *Catharanthus roseus* may open new avenues for creating wound care technologies that are safer, biodegradable, and biologically responsive.



**Figure 1.11: Workflow showing the development of bioherbal polymeric dressing for improved diabetic wound healing.**

## 11. CONCLUSION

Healing wounds in diabetic patients remains a challenging clinical issue due to not only localized tissue damage but also systemic metabolic imbalances, ongoing inflammation, and oxidative stress. The majority of currently available wound dressings primarily offer physical protection and moisture regulation, while providing minimal biological support for the intricate healing needs of diabetic wounds.

This review introduces a unique and concentrated viewpoint by highlighting bioherbal polymeric dressings that approach diabetic wound healing in a more comprehensive way. Instead of focusing on frequently studied plants or complicated herbal combinations, the article underscores *Catharanthus roseus* as a key bioherbal candidate for its significant role in enhancing the diabetic wound environment through its antidiabetic and antioxidant properties. The complementary use of *Curcuma longa* further elevates this approach by addressing prolonged inflammation and microbial contamination at the wound surface—two critical obstacles to healing in diabetic individuals.

A notable innovation of this review is the transition from prioritizing “quick wound closure” to fostering “a conducive wound microenvironment.” Rather than promoting rapid tissue regeneration, the proposed bioherbal chitosan–alginate system is conceptually designed to

stabilize the wound area, alleviate biological stress, and enable the body's natural healing processes to operate more efficiently. This perspective is in line with new evidence indicating that a controlled and balanced healing approach may be more advantageous than aggressive stimulation in chronic diabetic wounds.

By combining plant-derived bioactives with a well-established polymeric carrier, this review provides a practical and logical framework for the advancement of future wound-dressing technologies. While refraining from making experimental assertions, the article outlines a clear path for researchers to investigate safer, biodegradable, and biologically beneficial wound-care solutions. In summary, the ideas presented in this review offer a fresh and significant addition to the literature on diabetic wounds by merging simplicity, scientific rationale, and innovation in a way that is both suitable for further exploration and applicable in real-world settings.

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