Formulation And Evaluation of Aloe Vera Nano Gel for Burn Wound Healing

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***Abstract*—Burn injuries are one of the most common forms of trauma and often result in pain, Inflammation, microbial infection, and delayed wound healing conventional topical formulation of aloe vera although widely used for their soothing, anti-inflammatory, and wound healing properties, exhibit limited skin penetration and lower bioavailability of active photo constituents. To overcome this limitation, an aloe vera based nano gel was developed to in enhance therapeutic efficacy in burn wound management.**

Aloe –vera extract was incorporated into a nano – carrier system and formulated into a Carbopol – based topical gel using the cold dispersion method. Aloe vera is one of the most widely used medicinal plant in skin and wound treatment nano gel formulation enables enhanced drug retention, deeper skin penetration and sustained release of active phytoconstituents at the wound site various studies have demonstrated improve epithelialization, reduced inflammation and enhanced wound contraction in nano gel treated burn wound compare to traditional formulation is widely known for its anti-inflammatory, antimicrobial, moisturizing, and wound healing properties due to the presence of bioactive constituents such as polysaccharides, vitamins, enzymes, and amino acids. Incorporation of Aloe vera into a nanogel system enhances its penetration through the skin, improves stability, and provides controlled release of active constituents at the wound site.

The study concludes that Aloe vera nanogel can be considered a promising topical drug delivery system for effective burn wound healing with improved therapeutic efficacy and patient compliance.

***Index Terms*—Aloe vera, clear gel juice, polysaccharides health and beauty skin**

I.INTRODUCTION

1.1. Introduction of Burn Wound Healing

Aloe vera (Aloe barbadensis miller) is a medicinal plant widely used in skincare for its antibacterial, antioxidant and healing properties. However, its efficacy is limited by poor stability and skin penetration. nanotechnology offers a promising approach to Improve bioavailability through nanogel-hydrogel system containing nanosized particles that provide controlled drug delivery and enhance skin permeation.

Aloe vera is a well-known medicinal plant extensively used in traditional and modern medicine due its remarkable therapeutic properties. Including, anti-inflammatory, antimicrobial, antioxidant and wound healing activity. The gel extracted from the inner part of aloe vera leaf contains bioactive compound such as polysaccharide, vitamins, enzyme, and phenolic compound, which contribute to its wide range of pharmacological effect. However, conventional aloe vera formulation often suffer from issues like poor stability, limited skin penetration, and rapid degradation of active constituents.

Burn injuries are among the most common forms of trauma, often resulting in significant tissue damage, pain, inflammation, and risk of infection. Effective burn wound management aims to promote rapid healing, prevent microbial contamination, reduce scarring, and restore the protective function of the skin. Conventional topical formulation used in burn therapy such as a creams, ointments, and gel often suffer from limitation like poor skin penetration, rapid drug degradation, and inadequate retention at wound site.

1.2. Phases of wound healing

The mechanism underlying the healing process involves cellular, subcellular, physiological, and biochemical events which act together to repair injuries.It involves three main intersecting phases: inflammatory, proliferative, and tissue remodeling in normal conditions, these phases aren't discrete. However, in cases of initiation due to physical injury,

they must continue to the end in order for complete healing to be acheived

1.2.1.Skin healing process

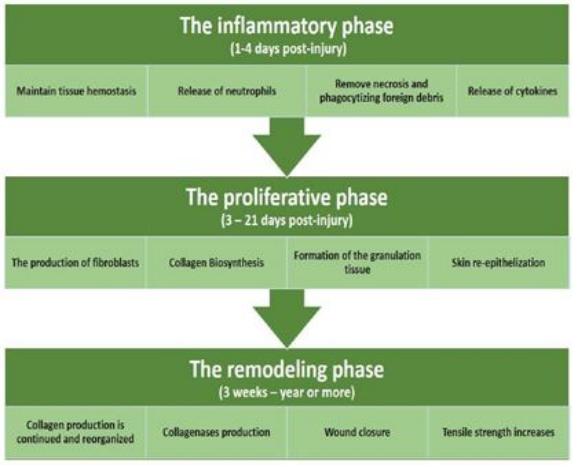

Fig. No.1: Normal Wound Phases and main events included.

1. Inflammatory phase

The inflammatory phase immediately follows the wounding incidence, and it takes approximately four days. It mainly fulfills two main goals. The first is to maintain tissue hemostasis, which this could be achieved by contraction of the smooth muscle cells, closure of the ruptured large blood vessels, and accumulation of platelets to thrombose the smaller damaged vessels. The second goal is to rid the wound of contaminants, bacteria and other unfavorable debris

2. Proliferative phase

The proliferative phase may last as long as three weeks post-injury. The activated macrophages mediate the release of fibroblast stimulating factors and angiogenesis factors Fibroblast stimulating factors promote the proliferation of fibroblasts, which plays an essential role in the proliferative phase. In turn, the fibroblasts produce collagen and proteoglycans. AGF promote the growth of the new blood vessels and capillary buds. The neovasculature together with the collagen and proteoglycans constitute the granulation tissue which, fills the wounded defects (Teller, White, 2011). The synthesis of collagen increases wound tensile strength.

3. Remodeling phase

The remodeling or maturation phase is the final step in the healing process. It begins approximately three weeks post-wounding and may last for more than one year. In this phase, the production of collagen by fibroblasts is continued. Collagenases are a group of enzymes secreted during this phase, which act to re-organize collagen bundles in a parallel arrangement, and lysis the collagen bundles produced during the proliferative phase. The closure of the wounded area and a gradual increase in tensile strength still progress in this phase. The ultimate strength of a healed wound depends on the quantity of collagen biosynthesis and the extent of crosslinking between neighboring collagen bundles. At the end of the maturation phase, the wound reaches maximal tensile strength, which is typically 80% of the strength of the original uninjured cutaneous tissue

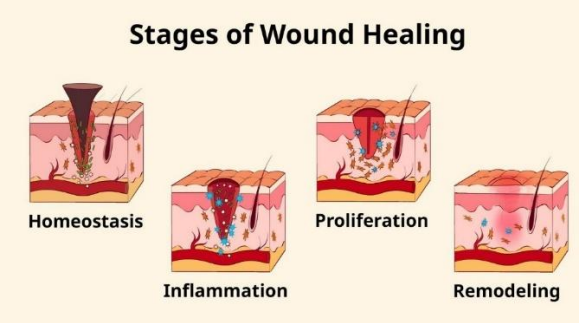

Fig. No.2

1.2.2.Properties of aloe vera for burn wound healing

- Anti-inflammatory: Reduces redness and swelling.
- Wound healing/Tissue Repair: stimulates collagen and fibroblast production, promoting faster skin regeneration.
- Antimicrobial: Helps prevent infection in the wound.
- Moisturizing: High water content prevents desiccation. (Drying out)
- Soothing: Alleviates pain and itching.

1.2.3.Key Benefits for Burn Healing

- Anti-inflammatory: Reduces redness and swelling, soothing the burn.
- Moisturizing and Skin Repair: High water content keeps skin hydrated; compound. like mucopolysaccharides and zinc improve skin integrity and moisture retention.
- Antimicrobial action: Its antibacterial and antiviral properties help prevent infection.
- Antioxidant Properties: protects damaged skin cells from further harm, aiding the recovery process.

1.3. Mechanism of Nano gel for Burn wound healing

- Enhanced Skin Penetration: Leads to faster absorption and improved Therapeutic effect.
- Anti-inflammatory Action: Decreasing redness, swelling, and burning sensation.
- Antimicrobial Activity: inhibit growth of bacteria like pseudomonas aeruginosa common in burn infections.
- Faster collagen synthesis: Fibroblast proliferation, better tissue. regeneration,strong wound closure, reduced scar formation.
- Moisturization and Hydration: supports natural epidermal regeneration.
- Antioxidant Activity: these reduce oxidative stress in burned tissre preventing cell death.
- Cooling and soothing: reduces burning sensation, provides immediate relief, decreases tissue heat after burn injury.

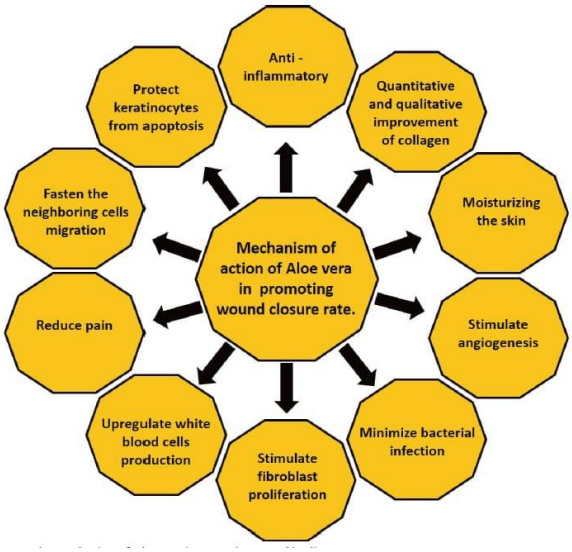

Fig. No.3: Mechanism of action

1.4. Biological Activity

Nano gel of aloe vera shows various biological activities that help in effective burn wound healing, tissue repair, and skin regeneration.

1. Anti-inflammatory Activity

Aloe vera contains compounds such as acemannan, glycoproteins, and flavonoids that reduce inflammation, redness, swelling, and pain at the burn site. It inhibits inflammatory mediators and soothes damaged skin.

2. Antioxidant Activity

Aloe vera possesses antioxidant components like vitamins C and E, phenolic compounds, and enzymes that neutralize free radicals produced during burn injury. This protects skin cells from oxidative damage and accelerates healing.

3. Antimicrobial Activity

Aloe vera exhibits antibacterial and antifungal activity against microorganisms commonly associated with wound infections. It helps prevent microbial contamination and supports clean wound healing.

4. Wound Healing Activity

The nano gel stimulates fibroblast proliferation, collagen synthesis, granulation tissue formation, and epithelialization. These processes promote rapid wound contraction and tissue regeneration.

5. Moisturizing and Hydrating Activity

Aloe vera maintains moisture at the wound surface, prevents dryness, and creates a favorable environment for cell growth and repair. Its cooling effect also reduces burning sensation.

6. Collagen Stimulating Activity

Aloe vera enhances collagen production and extracellular matrix formation, improving tensile strength and elasticity of newly formed skin tissue.

7. Skin Protective Activity

The nano gel forms a protective layer over the burn wound, reducing environmental contamination and minimizing scar formation.

8. Enhanced Drug Delivery by Nanogel

Nano-sized particles improve:
Penetration into deeper skin layers
Sustained release of active constituents
Bioavailability of aloe vera compounds
Retention time at wound site
This increases therapeutic efficiency compared to conventional aloe vera gel.

II. LITRATURE SURVEY

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III. AIM & OBJECTIVES

Aim:

To formulate and evaluate a nano gel containing aloe vera and curcumin for effective burn wound healing.

Objectives:

1. Evaluate the therapeutic efficacy of aloe vera nanogel formulation in accelelrating the healing of burn wound (specifically first and second – degree burns) based on existing clinical and preclinical studies.
2. Analyze the mechanism of action through which the bioactive compound in aloe vera (e.g., acemannan, vitamins, anti-inflammatory agents) promote tissue regeneration, collagen synthesis, and angiogenesis in a nanogel delivery system.
3. To formulate and evaluate a stable and effective aloe- vera –based nanogel for topical application using nanotechnology to enhance skin penetration, stability, and therapeutic efficacy of aloe vera extract.
4. To extract and standardize aloe vera gel from fresh aloe vera leaves for use as the primary bioactive herbal ingredient.
5. Determine the safety and potential side effect (e.g., skin irritation, allergic reaction) associated with the

topical application of aloe vera nanogel based on available data

IV. PLAN OF WORK

Introduction
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V. PLANT & DRUG PROFILE

5.1. Aloe Vera

The Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name Aloe vera derives from the Arabic word "Alloeh" meaning "shining bitter substance," while "vera" in Latin means "true." 2000 years ago, the Greek scientists regarded Aloe vera as the universal panacea. The Egyptians called Aloe "the plant of immortality." Today, the Aloe vera plant has been used for various purposes in dermatology.

5.1.1.Biological Source

The botanical name of Aloe vera is Aloe barbadensis miller. It belongs to Asphodelaceae (Liliaceae) family, and is a shrubby or arborescent, perennial, xerophytic, succulent, pea- green color plant. It grows mainly in the dry regions of Africa, Asia, Europe and America. In India, it is found in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.

5.1.2.Anatomy

The plant has triangular, fleshy leaves with serrated edges, yellow tubular flowers and fruits that contain numerous seeds. Each leaf is composed of three layers: 1) An inner clear gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. 2) The middle layer of latex which is the bitter yellow sap and contains anthraquinones and glycosides. 3) The outer thick layer of 15–20 cells called as rind which has protective function and synthesizes carbohydrates and proteins. Inside the rind are vascular bundles responsible for transportation of substances such as water (xylem) and starch (phloem).

5.1.3.Active components with its properties

Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.

1. Vitamins:

It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals.

2. Enzymes:

It contains 8 enzymes: aliiase, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase, cellulase, lipase, and peroxidase. Bradykinase helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.

3. Minerals:

It provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc. They are essential for the proper functioning of various enzyme systems in different metabolic pathways and few are antioxidants.

4. Sugars:

It provides monosaccharides (glucose and fructose) and polysaccharides: (glucomannans/polymannose). These are derived from the mucilage layer of the plant and are known as mucopolysaccharides. The most prominent monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans [beta-(1,4)-acetylated mannan]. Acemannan, a prominent glucomannan has also been

found. Recently, a glycoprotein with antiallergic properties, called alprogen and novel anti-inflammatory compound, C-glucosyl chromone, has been isolated from Aloe vera gel.7,8

5. Anthraquinones:
It provides 12 anthraquinones, which are phenolic compounds traditionally known as laxatives. Aloin and emodin act as analgesics, antibacterials and antivirals.

6. Fatty acids:
It provides 4 plant steroids; cholesterol, campesterol, β-sisosterol and lupeol. All these have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties.

7. Hormones:
Auxins and gibberellins that help in wound healing and have antiinflammatory action.

8. Others:
It provides 20 of the 22 human required amino acids and 7 of the 8 essential amino acids. It also contains salicylic acid that possesses anti-inflammatory and antibacterial properties. Lignin, an inert substance, when included in topical preparations, enhances penetrative effect of the other ingredients into the skin. Saponins that are the soapy substances form about 3% of the gel and have cleansing and antiseptic properties.

5.1.4.Medicinal Uses
- Treats burns and sunburn
- Promotes wound healing
- Reduces skin inflammation and irritation
- Helps in acne and eczema management
- Acts as a natural moisturizer for skin
- Relieves constipation (natural laxative effect)
- Supports digestion and soothes acid reflux
- Provides anti-inflammatory effects (useful in arthritis and muscle pain)
- Boosts immunity due to antioxidant content
- Improves oral health (reduces plaque, gum problems, mouth ulcers)
- Helps in controlling blood sugar levels (in type 2 diabetes)
- Promotes hair growth and reduces dandruff.

5.1.5.Role in Skin healing
Glucomannan, a mannose-rich polysaccharide, and gibberellin, a growth hormone, interacts with growth factor receptors on the fibroblast, thereby stimulating its activity and proliferation, which in turn significantly increases collagen synthesis after topical and oral Aloe vera. Aloe gel not only increased collagen content of the wound but also changed collagen composition (more type III) and increased the degree of collagen cross linking. Due to this, it accelerated wound contraction and increased the breaking strength of resulting scar tissue. An increased synthesis of hyaluronic acid and dermatan sulfate in the granulation tissue of a healing wound following oral or topical treatment has been reported.

Fig.No.4: Aloe Vera

5.1.6.Advantages of Aloe vera
1. Promotes Faster Wound Healing
Aloe vera helps increase collagen production and stimulates growth of new skin cells, which accelerates healing of burn wounds.

2. Anti-inflammatory Action
It reduces redness, swelling, pain, and inflammation at the burn site due to compounds like glucomannan and gibberellins.

3. Cooling and Soothing Effect
Aloe vera gel provides an immediate cooling sensation that helps relieve burning, irritation, and discomfort.

4. Antimicrobial Activity
Aloe vera possesses antibacterial and antifungal properties that help prevent wound infections.

5. Maintains Moist Environment
The gel keeps the wound moist, which is important for proper tissue repair and prevents drying or cracking.

6. Rich in Antioxidants
It contains vitamins A, C, and E along with polyphenols that protect damaged skin from oxidative stress.

7. Reduces Scar Formation
Aloe vera improves skin regeneration and elasticity, helping minimize scar formation after burn healing.

5.2. Curcumin
Curcumin is the main yellow-colored active compound found in turmeric (*Curcuma longa*), a plant commonly used as a spice and medicine. It is known for its strong anti-inflammatory, antioxidant, antibacterial, and wound-healing properties. Curcumin belongs to a group of natural compounds called curcuminoids, which are responsible for turmeric's color and medicinal effects. Curcumin helps reduce inflammation by controlling various biochemical pathways and preventing the release of inflammatory mediators.
Its antioxidant action protects skin and body cells from free-radical damage.

5.2.1.Source of Curcumin
Curcumin is obtained from the rhizomes of the plant *Curcuma longa*, commonly known as Turmeric.

It belongs to the Zingiberaceae (Ginger) family.
Chemical Class: Curcuminoids
Chemical Formula: $C_{21}H_{20}O_6$
Molecular Weight :368.38 g/mol

5.2.2.Pharmacological Actions:
- Anti-inflammatory
- Antioxidant
- Antibacterial (effective against Cutibacterium acnes)
- Wound healing
- Antimicrobial
- Anticancer

5.2.3.Chemical Constituent
- Curcumin
- Demethoxycurcumin
- Bis-demethoxycurcumin
- Volatile oil Zingiberene

Fig.5 Curcumin

5.2.4.Uses
- Anti-inflammatory, antioxidant, antimicrobial.
- Used in arthritis, wound healing digestive disorders.
- Potential anticancer activity.

5.2.5.Advantages of Curcumin
1. Strong Anti-inflammatory Activity
Curcumin reduces inflammatory mediators (like TNF-α, IL-1, IL-6), helping decrease swelling, redness, and pain in burn wounds.

2. Powerful Antioxidant Effect
It neutralizes free radicals generated in damaged tissues, protecting cells from oxidative stress and further injury.

3. Enhances Collagen Formation
It stimulates collagen deposition and improves extracellular matrix formation, strengthening newly formed skin.

4. Antimicrobial Properties
Curcumin inhibits growth of bacteria and fungi, reducing the risk of infection in burn areas.

5. Reduces Scar Formation
It modulates fibroblast proliferation and collagen organization, helping minimize hypertrophic scars.

VI. MATERIALS AND METHODS

6.1. Materials

Materials	Category	Role
Aloe vera gel	Active ingredient	Skin healing
Curcumin	Anti-inflammatory	Enhanced skin repair
Carbopol 940	Gelling Agent	Gel formation
Propylene glycol	Humactant	Moisturizer
Tween 80	Surfactant	Vesicle formation
Methyl paraben	Preservative	Anti-fungal activity
Triethanolamine	pH adjuster	Neutralization
Distilled water	Vehicle	Solvent

6.2. Instrument

Instruments	Use
Magnetic stirrer	Mixing
Homogenizer	Reduces particle size
pH meter	pH determination
Brookfield viscometer	Viscosity measurment
Centrifuge	Entrapment study

6.3. Formulation table

Material	F1 (30gm)	F2 (30gm)	F3 (30gm)
Aloe vera gel	6g	7.5g	9g
Curcumin	0.3g	0.6g	0.9g
Carbopol 940	0.3g	0.3g	0.3g
Propylene glycol	3ml	3ml	3ml
Tween 80	0.6g	0.9g	1.2g
Methyl paraben	0.06g	0.06g	0.06g
Triethanolamine	q.s.	q.s.	q.s.
Distilled water	q.s. to 30gm	q.s. to 30gm	q.s. to 30gm

6.4. Methodology

6.4.1.Collection and Preparation of Aloe vera Gel

1. Collect fresh Aloe vera leaves.
2. Wash thoroughly with distilled water to remove dirt.
3. Remove the outer green layer using a sterile knife.
4. Collect the transparent inner gel carefully.
5. Filter the gel using muslin cloth or filter paper to remove fibers and impurities.
6. Store the gel in a clean beaker.

Fig.No.6

6.4.2.Preparation of Curcumin Nano Dispersion

1. Take a clean beaker.
2. Add measured quantity of Tween 80 and propylene glycol.
3. Add curcumin slowly into the mixture.
4. Stir continuously using magnetic stirrer for 15–20 minutes.
5. Subject the mixture to sonication or homogenization for 10–15 minutes to reduce particle size and obtain nano dispersion.

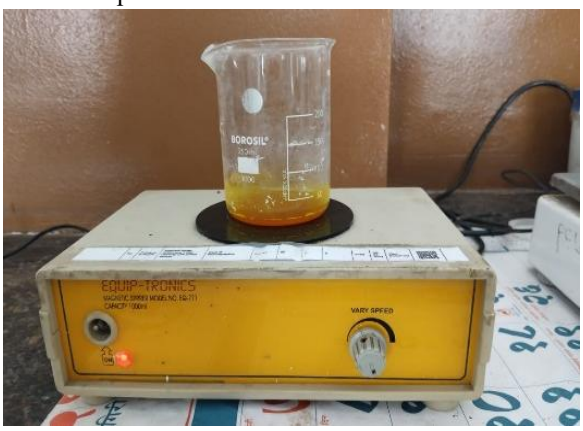

Fig.No.7

Fig.No.8

6.4.3.Preparation of Gel Base

1. Take required quantity of distilled water in another beaker.
2. Add Carbopol 934/940 slowly with continuous stirring to avoid lump formation.
3. Continue stirring until Carbopol disperses completely.
4. Allow the solution to stand for 30–60 minutes for proper swelling and hydration.

Fig.No.9

6.4.4.Incorporation of Aloe vera Gel

1. Add prepared Aloe vera gel slowly into the hydrated Carbopol gel base.
2. Stir gently using glass rod or magnetic stirrer.
3. Continue mixing until uniform consistency is obtained.

Fig.No.10

6.4.5.Incorporation of Curcumin Nano Dispersion

1. Add prepared curcumin nano dispersion slowly into the Aloe vera gel base.
2. Stir continuously for 20–30 minutes using magnetic stirrer.
3. Ensure uniform distribution of nano particles throughout the gel.

Fig, No.11

Fig.No.12

VII. EVALUATION OF NANO GEL

Advanced evaluation of aloe vera nano gel includes physical, pharmaceutical, stability, and wound healing studies to ensure safety, efficacy, and therapeutic performance.

7.1. Visual Inspection

- Evaluate appearance and consistency
- Check homogeneity of formulation
- Observe color and texture
- Detect phase separation or lumps

Fig.No.13

7.2. Organoleptic Evaluation

- Colour: Yellow to golden yellow
- Odour: Caharacteristic pleasant
- Texture: Soft and smooth
- Consistency: Semisolid

7.3. pH Measurement

- Measured using calibrated digital pH meter.
- Ideal pH range: 5.5-7.0
- Important for skin compatibility and formulation stability
- Suitale for topical application without causing irritation

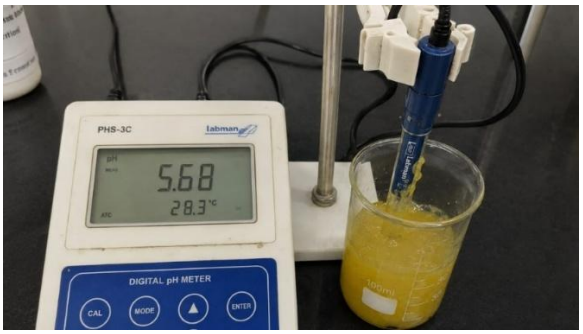

Fig.No.14

7.4. Viscosity Study

- Measured using Brookfield viscometer.
- Determines the resistance of gel to flow under applied rotational force.
- Moderate viscosity indicates easy flow and application.

Fig.No.15

7.5. Spreadability

- determine the ease with which the nanogel spreads on the skin surface after application
- Spreadability depends on the slip and drag characteristics of the gel between two glass slides under applied weight.
- To improve patient compliance

7.6. Homogeneity

- detect lumps or aggregates
- confirm proper mixing of ingredients
- uniform appearance and consistency without visible particles, lumps, or phase separation.

7.7. Skin Irritation Study

- suitable topical nanogel should not produce irritation, redness, itching, or inflammation after application on skin.
- No itching or swelling confirms safety of formulation.
- ensure skin compatibility

7.8. Stability Studies

Formulation stored at room and refrigerated temperatures.

Evaluated periodically for:

- Colour change
- pH Variation
- Viscosity
- Odour
- Phase separation.

7.9. Final product

Fig.No.16

Fig.No.17

Fig. No. 18

VIII. RESULT AND DISCUSSON

The prepared Aloe vera–Curcumin nanogel was successfully formulated and evaluated for various physicochemical parameters. The formulation showed good appearance, homogeneity, stability, spreadability, viscosity, and skin compatibility. The nanogel was smooth, yellowish in color, and free from lumps or phase separation.

The presence of Aloe vera provided moisturizing, cooling, and soothing effects, while Curcumin contributed anti-inflammatory, antioxidant, and antimicrobial activities. The nanogel formulation enhanced drug penetration and retention at the wound site, promoting faster healing and tissue regeneration.

Evaluation of nano gel was carried out as per standard procedures and the results are mentioned below:

8.1. Evaluation Test Result

Sr.no.	Evaluation parameter	F1	F2	F3
1	Colour	Light yellow	Yellow	Drak yellow
2	Odour	Characteristic	Characteristic	Characteristic
3	Appearance	Smooth gel	Smooth gel	Smooth homogeneous gel
4	pH	6.2	6.5	6.8
5	Homogeneity	Good	Excellent	Excellent
6	Viscosity	Moderate	Good	Hey
7	Spreadability	Good	Very good	Excellent
8	Stability study	Stable	Highly stable	Stable
9	Phasc separation	Absent	Absent	Absent
10	Skin irritation study	No irritation	No irritation	Mild irritation absent

8.2. Discussion

- The prepared nanogel was smooth, homogeneous, and free from lumps or phase separation, indicating successful incorporation of Aloe vera and Curcumin into the gel base.
- The yellowish appearance of the formulation was due to the presence of Curcumin, while the smooth texture indicated proper dispersion of nanoparticles within the gel matrix.
- The nanogel delivery system enhances penetration of active constituents into deeper skin layers and improves retention at the site of application.
- The nanosized particles increase surface area and drug release, which may contribute to faster healing and tissue regeneration.
- No signs of redness, itching, or edema were observed during the skin irritation study for all formulations, confirming safety for topical administration. Stability studies indicated that the formulations remained physically stable without changes in color, odor, pH, or consistency.

IX. SUMMARY AND CONCLUSION

9.1. Summary

The present study was focused on the formulation and evaluation of a nanogel containing Aloe vera and Curcumin for burn wound healing. Burn wounds are highly susceptible to infection, inflammation, pain, and delayed healing; therefore, an effective topical drug delivery system is essential for faster recovery and tissue regeneration.

Aloe vera was selected due to its soothing, moisturizing, anti-inflammatory, and wound healing properties, while Curcumin was incorporated because of its antioxidant, antimicrobial, and anti-inflammatory activities. The combination of these two natural agents was expected to enhance the overall burn wound healing effect.

The nanogel formulations (F1, F2, and F3) were successfully prepared using suitable polymers and gelling agents. The prepared formulations were evaluated for different physicochemical parameters such as appearance, pH, homogeneity, spreadability, viscosity, drug content, extrudability, skin irritation, and stability studies.

9.2. Conclusion

In conclusion successfully formulated and evaluated a nanogel containing Aloe vera and Curcumin for burn wound healing applications. The developed nanogel showed satisfactory physicochemical properties such as good homogeneity, suitable pH, optimum viscosity, excellent spreadability, and good stability, indicating its suitability for topical administration

Among the prepared formulations, F2 was identified as the optimized formulation because it exhibited better drug content, ideal consistency, superior spreadability, and excellent stability compared to F1 and F3. The nanogel system also improved retention and penetration of the active constituents at the wound site, which may contribute to faster healing and tissue regeneration.

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