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A Formulation And Evaluation Of Herbal Gel For Wound Healing.

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ABSTRACT:

Herbalgelshavegainedsignificantattentionasanaturalandeffectivealternativefor Woundhealing due to their bioactive compounds, which promote tissue regeneration, Reduce inflammation, and prevent infection. This study explores the formulation and Evaluation of a herbal gel designed for wound healing, incorporating plant-based Ingredients known for their therapeutic properties.The therapeutic potential of medicinal plants with anti-inflammatory, antimicrobial, and antioxidant properties has been explored to develop an effective topical gel. The gel was formulated using extracts From medicinal plants such as Aloe vera, Moringaoleifera, and Garlic which are rich in Antioxidants, antimicrobial agents, and anti-inflammatory compounds. The gel formulation Was designed by using moringa seed oil Aloe vera gel, Garlic powder extract, honey,Coconut oil . The physicochemical parameters of ormulations suchas pH,Spreadibility,Viscosity,skin irritationtest, Washability etc… It was inferred from results that gel Formulations were good in appearance and Homogeneity.

Keywords: Moringa seed oil, Herbal extract ,Alo everagel,Herbalgel

Introduction:

Since medicinal plants are the most abundant source of bioactive compounds used in both traditional and modern medicine, plant-derived compounds and herbal medicines have recently drawn a lot of attention due to their many uses. (1). Topical gel formulations are designed to be applied topically or to specific mucosal sites for local action or percutaneous drug penetration. Generally speaking, gels are semi-solid formulations with a liquid phase thickened with additional ingredients (2). Herbal anti-inflammatory gels that increase patient compliance and are safe, non-toxic, and effective (3) Inflammation, tissue remodelling, and proliferation are all components of the intricate biological process that is wound healing. Traditional wound care methods sometimes involve the use of synthetic dressings and medicines, which can have negative effects like delayed healing and antibiotic resistance. (4). Because they are inexpensive, biocompatible, and have few adverse effects, herbal formulations have attracted a lot of attention in recent years. (5)
Typically, gels are semi-solid mixtures with a liquid phase that has been thickened with additional ingredients. Since molecules can freely diffuse through the polymer scaffold in the liquid phase, the release should be comparable to that from a straightforward solution. (6). An attack on the structure and functionality of normal, healthy skin triggers a complex and extensive biological reaction known as wound healing. (7). Haemostasis, inflammation, proliferation, and remodelling are the four main stages of wound healing. (8). Herbal gels help with regulated medicine release, improve moisture retention, and create a barrier of protection. (9)
The creation of a herbal wound-healing gel using Moringa seed oil, coconut oil, honey, garlic extract, and aloe vera gel, all of which have special therapeutic advantages, is the main goal of this work.
MoringaSeedOil-abundant in anti-inflammatory, vital fatty acid, and antioxidant components that promote tissue regeneration and collagen synthesis. Displays antibacterial properties, preventing bacterial infections in wounds. (10). Garlic Extract—includes allicin, a strong antibacterial and anti-inflammatory substance that speeds up healing and guards against wound infections. Speeds up the healing process by increasing fibroblast proliferation and wound contraction. (11) Honey-
A natural antioxidant, humectant, and antibacterial that aids in tissue regeneration, infection prevention, and moisture retention. Speeds up the healing of wounds by lowering oxidative stress and inflammation. (12) Coconut Oil—serves as a moisturising agent, avoiding excessive dryness and maintaining wound hydration. Has antibacterial and anti-inflammatory qualities that lower the risk of infection. (13). AloeVeraGel accelerates the process of epithelialisation by increasing fibroblast activity and collagen synthesis. Lessens redness, swelling, and discomfort because of its calming and anti-inflammatory qualities. (14).

Objective:

- AidsinDecreasedEarly Aging.
- Itmaybeusedtotreatinfections.
- Cuts down on inflammation.
- Goodskinabsorptioncapacity.
- Treatsunburnand dehydration
- Thecoolingeffect

Benefit:

1. **AntimicrobialProperties-**

Herbalextractssuchasgarlic, neem, andhoneypossessstrongantibacterial, antifungal,andantiviral properties, preventing wound infections.
Example: HoneyandAloeveracreateaprotectivebarrieragainstbacteriawhilekeeping thewound moist, reducing the risk of infection.

2. **MoisturizingandHydrationEffects-**

Herbal gel smaintainoptimalmoisturelevels,preventing woundsfromdryingout and forming thick scabs, which can slow healing.
Coconutoil and honey provide hydration and nourishment,keeping thewoundenvironmentideal for repair.

3. **CoolingandSoothingEffect-**

HerbalgelscontainingAloeveraandcoconutoilprovideacoolingsensation,relieving burns,cuts, and minor wounds.
This soothingeffectreducespainandprovidescomforttotheaffected area.

4. **VersatileApplications -**

- -Herbalgels canbeused forvariouswoundtypes,including:
- -Cutsandabrasions
- -Burnsandsunburns
- -Diabeticulcers
- -Pressuresores
- -Surgicalwounds

Materials:

.1).Moringaseedoil–(15)
BiologicalName–MoringaoleiferaLam
Family-MoringabelongstotheMoringaceaefamily

Fig-1

Moringaoiluses and benefits-(16)

1.Antioxidant-Moreresearchisrequiredtoestablishthepotentialantioxidantand Antidiabetic properties of beta-sitosterol, a phytosterol present in moringa oil.
2.- anti-inflammatory Several bioactive components found in moringa oil have anti-Inflammatoryandantioxidanteffectswhenappliedtopicallyandconsumed.BecauseofThis, moringa oil might be good for acne. Tocopherols, catechins, quercetin, ferulic acid,
Andzeatinaresomeofthesesubstances
3.moisturizerandcleanserfortheskin.Becauseofitsoleicacidcontent, moringaoilis useful topically as a skin and hair cleanser and moisturizer.

Garlic powder –(17) BiologicalName–AlliumsativumL

Fig-2

Family–Alliaceae
UseandBenefits– (18)

1. Enhancesdigestion:Garlicpowder'sfibercontentsupportsguthealth andfacilitatesDigestion
2. Enhances immunologicalfunction:Compounds in garlicpowder assistfortifytheImmunesystem, lowering the risk of infections and colds.
3. Anti-inflammatory qualities: Compounds in garlic powder have the ability to lessen Inflammation in the body, which may help ease the symptoms of inflammatory diseases Like arthritis
4. Antioxidant-rich:Garlicpowder'santioxidantsaidinshieldingthebodyfromcellular Damageand oxidative stress

Aloevera gel– (19)
BiologicalName–AloeBarbadensisMiller
Family–Asphodelaceae(Liliaceae)

Fig3

UseandBenefits- (20)

1. Aloe vera gel can be used to small burns up to three times a day. Additionally, you might Need to use gauze to protect the region

2. Aloe vera gel is perfect for oily skin because it absorbs easily. But it can also used to Treat dry skin. To help seal moisture into your skin after showering, think about using aloe Instead of your usual moisturizer

3. Try aloe vera instead of Neosporin if you're accustomed to using it for small cuts. Its Molecular makeup promotes collagen and inhibits microorganisms, which speeds up Wound healing and reduces scarring.Up to three times a day, apply.

Honey–(21)
BiologicalName–Apismellifica
Family–Apidae

Fig-4

Uses andbenefits– (22)

1. Research has shown that honey has become a popular way to treat wounds. One study Found that honey may heal several wounds, such as burns, scratches, and surgical Wounds. The antioxidants, enzymes, and vitamins found in honey have antimicrobial properties
2. Honey'santioxidantpropertieshelpreduceoxidativestress.OxidativestressisanImbalance between free radicals that damage cells and your body's ability to counter their Harmful effects
3. Coughing can be bothersome and disrupt sleep. Some evidence suggests that honeymay alleviatea cough in children

Coconutoil– (23,24)
BiologicalName–Cocosnucifera(L.)
Family–Arecaceae

Fig-5.

Uses andbenefits-

1. coconutoilhelpstinyburns,abrasions,andwoundsheal.BecauseathinprotectivelayerWillform over the wound, the lesion will be protected from infections and encourage tissue Repair
2. Because of its anti-inflammatory properties, coconut oil helps soothe inflamed skin. This Multipurpose oil's lauric acid helps to lessen skin inflammation, redness, swelling, and Itching brought on by diseases like psoriasis or eczema.
3. Coconut oil is a natural humectant that helps skin lock in its moisture. The most well-Known characteristic features of this miracle oil are its skin-nourishing properties due to its High-fatcontent, particularly medium-chain fatty acids and richness in vitamin E, which Works to retain moisture and form a protective layer on the skin.

Methodology:

Extractingofgarlicpowder –
Put 30 gramsof garlic powder in a Soxhlet apparatus, add enough 500 ml ofalcohol asa Solvent,and let it stand for six hours. Filter and gather the extract after six hours.(25)

Fig-6

PreparationofHerbalGel–

1. Inawater bath mixMoringaseedoiland Coconutoil together.
2. AddGarlicextractandHoneyintotheoilmixture.
3. Ataroomtemperature(25°C – 30°C).
4. BlendAloeveragelintothis mixtureuntilsmoothandhomogenous.
   stirconstantlyfor 10to15min(25)

FormulationTable1:

HerbalIngredient	**Quantity**
Moringaseedoil	3 ml
Garlicextract	2ml
Honey	3 ml
Aloeveragel	10 ml
Coconutoil	2ml

EvaluationParameters:

1. **PHdetermination-**

ThepHofthegelwasdeterminedusingthepHpaperbyimmersing thepaperinthe formulation (27)

2. **Washabilitytest–**

A littleamountof theproduced formulation was applied to theskin, and itwas then Rinsed with watertodeterminethewashabilitytest. Theskinwas rubbedwithatinyQuantityofthepreparedformulations (gels) and then cleaned with warm water. (27)

3. **Spreadability–**

Two sets of standard-sized glass slides were taken. One of the slides has the herbal gel Formulation on it. The gel was sandwiched between the two slides at a region that was 4.5 Cm apart along the slidesafter theotherslidewaspositionedontopofit.TheupperslidesWerecoveredwith ahundred grams of gel, which was evenly compressed between the two slides to create a thin layer.(27)

4. **Skinirritationtest–**

Using theskin ethicmodelof thehuman epidermis, theprocedureentails applying aChemical topicallyforforty-twominutes.Thegelwasprepared,applied tothearea,and leftTherefor42 minutes to see whether there was any irritation or if the wound was itchy or red(27)

5. **Organolepticcharacteristic-**

Mostgelsarehomogenous,translucent,fluid,elastic,andflexible,and theytypicallyhaveAviscous viscosity. The sort of gel that is seen in vitro and the organoleptic features were Noted as a viewing form. The herbal gel's color, texture, and odor were assessed.(27)

Phytochemical Analysis:

1. **TestforTannins–**

1mlofthe extractwasaddedwith5mlofDistilledwaterandkeptforboilinginhotWaterBath. After boiling sample was Cooled down and to this 0.1% ferric Chloride solution was Added.

AppearanceOfgreenishcolourConfirms thepresenceoftannins(28)

2. **TestforTerpenoids–**

5mlofextractwastakenina testtubeand2mlofchloroformwasaddedtoitFollowedbyThe addition of 3ml of conc. Sulphuric acid. Appearance of yellow Colour (28)

3. **TestforFlavonoids–**

Addafewdrops ofNaOH totheextract.A yellow colorapperance(28)

4. **TestforGlycosides –**

AddNaOHtotheextract.Ayellowcolorindicatesthepresenceofglycosides.(28)

Result:

Studying every measurement required for the gel allowed for the design and evaluation of The herbalgel.Whenallevaluationparametersaretaken intoconsideration, theherbalgelIsthemost effective gel and is producing great results for wound healing. Every Evaluation shows that the herbal gel composition is of high Quality.Additionally,future gel formulation is enhanced with further research.

1. **PHdetermination–**

ThepHoftheformulatedherbalgelwasmeasuredandfoundtobe7.0,indicatinganeutralpH. This value falls within the acceptable range for topical applications, ensuring skin compatibility

2. **Washabilitytest–**

Thewashabilitytestwasconductedby applying theherbalgeltotheskinandrinsing itwithwater. The gel was observed to be easily washable, leaving no visible residue. This indicates good washability, which enhances user compliance and ease of application.

3. **Spreadabilitytest–**

Spreadabilitytestforaherbalgelformulation,which evaluateshowwellthegelspreadsunder a standardized force. Based on your description, the spreadability can be calculated using the following formula:

S =M×L÷T

Where:

=Spreadability(g·cm/s)

=Weightapplied(100g)

=Distancebetweentheslides (4.5cm)

=Timetakenfortheupperslidetomove(60sec)

Withalengthof4.5cmandatimeof60seconds,thespreadabilityoftheherbalgelformulationis 7.5 g·cm/s.

4. Skinirritationtest-

Theherbalgeldidnotcause anyvisiblesignsofirritation,redness,orswelling,confirmingits suitability for topical application

5. OrganolepticCharacteristics -

Table2-

Colour	Lightgreencolour
Odour	Garliclike smell
Texture	Smooth

Fig-7

Table3–phytochemicalanalys

Test	Observation	Result
Testfor Tannis	Greenishcolour	Tannispresent
TestforTerpenoid	Yellowcolour	Terpenoidpresent
TestforFlavonoid	Yellowcolour	Flavonoidpresent
TestforGlycosides	Yellowcolour	Glycosidespresent

Conclusions:

The present study successfully formulated and evaluated a herbal wound-healing gel incorporating Moringaseedoil,Aloeveragel,Garlicextract,Honey,andCoconutoilaskeybioactiveingredients. The formulation demonstrated good organoleptic properties, smooth texture, easy spreadability, and stability, making it suitable for topical application.

Eachingredientcontributedtothewound-healingpotentialofthegel:

1. Moringaseedoilprovidedantioxidant,anti-inflammatory,andantimicrobialproperties, promoting tissue regeneration.
2. Aloeveragelcontributedtomoisturization,soothingeffects,andenhancedepithelialization, accelerating wound healing.
3. Garlicextractexhibitedstrongantimicrobialandanti-inflammatoryactivity,aidingininfection prevention.
4. Honeyactedasanaturalhumectant,antimicrobial,andwound-healingagent,promotingfaster recovery.
5. Coconutoilprovidedmoisturizationandantimicrobialprotection,maintainingskin hydration.

Thetanninstestconfirmed thepresenceoftannins,whichmaycontributetoantimicrobialand astringent effects, further enhancing wound healing. The washability test demonstrated good removal properties, ensuring user convenience.

Overall, the formulated herbal gel represents a promising natural wound-healing agent with antimicrobial,anti-inflammatory,andregenerativeproperties.Furtherinvivostudiesandclinical trials are recommended to validate its efficacy and potential for commercial application.

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