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Research Article

**FORMULATION AND EVALUATION POLYHERBAL WOUND
HEALING OINTMENT**Riya G. Chavhan¹, Aditi V. Tikait², Dr. Swati P. Deshmukh³¹ Student, Shraddha Institute of Pharmacy, Washim² Assistant professor, Department of Pharmaceutics, Shraddha Institute of Pharmacy, Washim³ Principal, Department of Pharmacology Shraddha Institute of Pharmacy, Washim**Abstract:**

The current study uses extracts from medicinal plants that are known to have therapeutic qualities to formulate and assess a polyherbal wound-healing ointment. The biological process of wound healing is intricate and involves remodeling, tissue creation, and inflammation. There is a demand for safer and more effective herbal alternatives because conventional therapies may result in side effects or microbial resistance.

Neem (*Azadirachta indica*), Tulsi (*Ocimum sanctum*), Turmeric (*Curcuma longa*), and Gotu Kola (*Centella asiatica*) were among the plants employed in this study because of their well-established antibacterial, anti-inflammatory, antioxidant, and wound-healing properties. A number of physicochemical criteria, such as appearance, pH, spreadability, washability, and irritancy, were assessed for the formulation. Compatibility was indicated by the pH being found to be within the permissible skin range. The ointment was easily applied to the skin and had good spreadability. The formulation's non-irritating properties and topical safety were verified by irritancy testing. According to stability experiments, the formulation held up well in a variety of storage scenarios. By limiting microbial infection, lowering inflammation, encouraging collagen production, and quickening tissue regeneration, the combined effect of herbal substances improved wound healing. The optimized formulation outperformed the other batches in terms of washability and spreadability.

Keywords : wound healing, polyherbal, combination herb.

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1. INTRODUCTION:

Physical injuries that cause the skin or underlying tissues to lose their normal continuity and function are referred to as wounds. Cuts, burns, abrasions, trauma, surgery, infections, or long-term pathological illnesses including diabetes and vascular problems can all cause them. Since the skin is the body's main line of defense, any damage to it can result in tissue destruction, discomfort, infection, delayed healing, and fluid loss. (1)

A series of cellular and biochemical processes, including hemostasis, inflammation, proliferation, collagen synthesis, angiogenesis, wound contraction, and tissue remodeling, are involved in the intricate and dynamic biological process of wound healing. The type of wound, microbial contamination, oxidative stress, nutritional state, and therapeutic intervention are some of the variables that affect the rate and quality of healing. (2)

Antiseptics, antibiotics, anti-inflammatory medications, and synthetic dressings are all part of conventional wound care therapy. These treatments may have significant drawbacks, including high cost, allergic responses, microbial resistance, delayed tissue regeneration, and negative effects after extended usage, even when they are somewhat effective. The use of herbal remedies and plant-based topical preparations for the treatment of wounds is becoming more popular due to these disadvantages. (3)

When two or more medicinal herbs are combined in a single dosage form to increase therapeutic efficacy through synergistic action, this is referred to as a polyherbal formulation. Because wound healing necessitates several pharmacological effects at once, including infection prevention, inflammation reduction, free radical neutralization, collagen synthesis stimulation, and epithelialization acceleration, polyherbal formulations are particularly useful in wound management. A more thorough and successful therapeutic response can be obtained by combining specific medicinal herbs with established wound healing qualities as opposed to using only one herb. (4)

The current study focuses on creating a polyherbal wound-healing ointment using specific medicinal plants, including gotu kola (*Centella asiatica*), neem (*Azadirachta indica*), tulsi (*Ocimum sanctum*), and turmeric (*Curcuma longa*), all of which are well-known in traditional medicine for their skin-protective and wound-healing properties. (5)

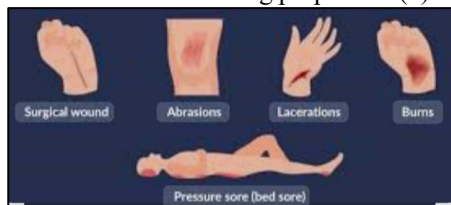


Fig no 1 : wounds

Causes

1. **Trauma:** Wounds such lacerations, abrasions, and punctures are caused by external sources like sharp objects, harsh trauma, or physical harm. These wounds usually fall under the category of acute wounds and are frequently caused by accidents and physical assault.
2. **Surgery:** Intentional wounds used to access organs or tissues for medical purposes are known as surgical incisions. When appropriate wound care is given, these acute wounds typically heal in a controlled way.
3. **Burns:** Caused by heat, radiation, chemicals, and electricity, burns result in varying degrees of tissue damage. Depending on the extent of tissue damage, burns are categorized as superficial, partial-thickness, or full-thickness. (6)
4. **Cuts or Incisions:** Caused by sharp things like medical equipment, glass, knives, or blades. The borders of these incisions are typically clean.
5. **Lacerations:** Resulting from tearing force or physical damage. The uneven borders of the incision could harm nearby tissue.
6. **Crush injuries:** These include injuries from mechanical or traffic accidents that result from extreme pressure or compression. May affect bones, muscles, and deeper tissues. (7)

Stages of wound healing

Phases of the wound healing process is difficult biological processes, including hemostasis, inflammation, proliferation, and remodeling, are involved in wound healing.

1. Hemostasis (0–10 minutes)

- Vasoconstriction: to lessen bleeding, blood arteries tighten.
- Platelet aggregation: a plug is created when platelets group together.
- Clot formation: a clot is created when fibrinogen is transformed into fibrin.

2. Inflammation (days 0–4)

- Enhanced blood flow: When blood arteries widen, white blood cells can enter the wound.
- White blood cell migration: White blood cells clear waste and combat infection.
- Cytokine release: the healing process is coordinated by chemical signals. (8)

3. Proliferation (4–21 days)

- Granulation tissue formation: New tissue, such as collagen and blood arteries, develops.
- Angiogenesis: In the wound, new blood vessels form.
- Epithelialization: New epithelial cells cover the surface of the wound.

4. Remodeling (21 days to 2 years)

- Collagen synthesis: Tissue is strengthened by the production of collagen.
- Collagen remodeling: To repair tissue structure, collagen fibers are rearranged.
- Tissue strengthening: over time, the wound gets stronger. (9)

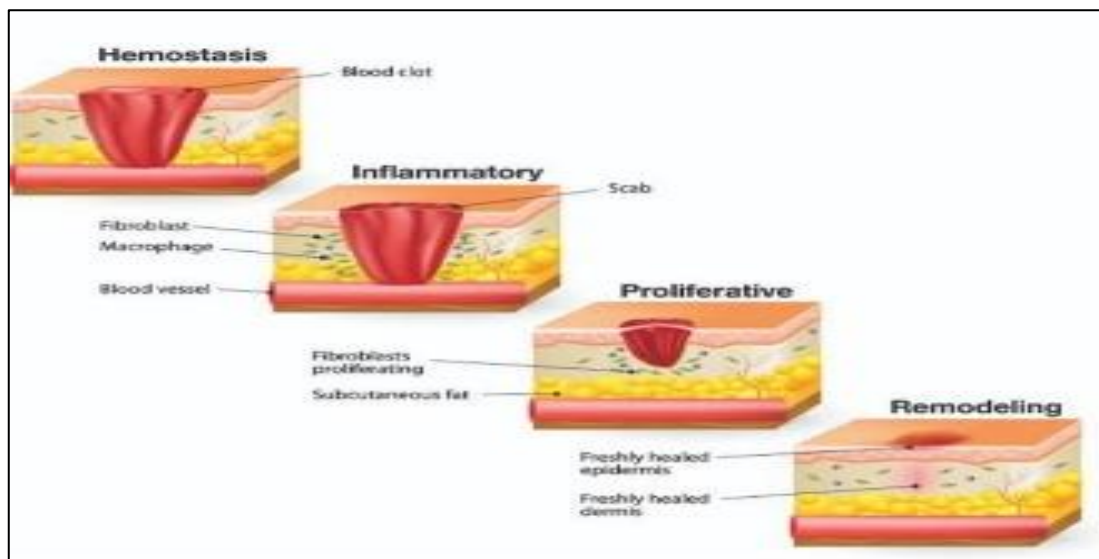


Fig no 2 : stages of wound healing

2. MATERIALS AND EQUIPMENTS

The plant were collected from the botanical garden of shraddha institute of pharmacy dried, preserved until further use.

Materials

Table no 1 : List of materials

Sr no	Ingredient	uses
1	Turmeric	Anti- inflammatory
2	Neem	Anti -bacterial
3	Tulsi	Antiseptic, antioxidant
4	Gotu kola	Wound healing
5	Beeswax	Base
6	Liquid paraffin	Emollient
7	Methyl paraben	Preservative
8	Rose water	Fragrance enhancer

Equipments

1. Analytical balance
2. Hot plate
3. PH meter (10)

3. METHOD AND EVALUATION:

Method

1. Preparation of Turmeric extract

Stir 1 g of turmeric powder with 10 ml of distilled water in a 250 ml volumetric flask that has been heated in a water bath for 5 to 10 minutes at 80°C to 100°C. After filtering it, turmeric extract is produced. (11)



Fig no 3: Turmeric extraction

2. Preparation of neem extract

The leaves of neem have been picked and washed with pure water, dehydrated in an air oven. The leaves had been powdered after drying properly. For 5 to 10 minutes, take 5 grams of neem powder in 20 ml of ethanol at 100 C. Then it's filtered through a filter paper, and the solution is clear.



Fig no 4 : Neem extraction

3. Preparation of tulsi extract

Tulsi leaves were gathered, cleaned with distilled water, then dried in an oven using hot air. The leaves were then ground up after a thorough drying process. Then volumetric flask was filled with 1 g of tulsi leaf powder and 10 ml of dimethyl sulfoxide. The solution was then boiled in a water bath at 80°C to 100°C for 5–10 minutes before being filtered through filter paper and tulsi leaf extract. (12)



Fig no 5: Tulsi extraction

4. Preparation of Gotu kola extract

Take 10 gram of gotu kola powder, add 100 ml distilled water soak powder in water for 15 to 30 min. heat the mixture and boil gently for 20 to 30 min. stir occasionally, reduce volume about 1/2 , allow to cool at room temperature, filter through muslin cloth or filter paper. (13)



Fig no 6: Gotu kola extraction

Preparation of topical formulation

Take 75 °C liquid paraffin and bees wax and heat it there (oil phase) in a borosilicate glass breaker. methyl paraben should be dissolved in distilled water in another beaker while maintaining a temperature of 75°C with a water bath. The aqueous phase of the solution should be stirred with a glass rod until all solid particles are dissolved. Gently pour the hot aqueous phase into the heated oily phase while continuing to mix. Turmeric extract, Tulsi extract, Neem extract, and Gotu kola extract should be added right away after combining the two stages. Glass rod blending should continue until a smooth cream emerges. Rose water should be added as a fragrance once the cream has formed. (14)



Fig no 7 : polyherbal wound healing ointment

Table no 2 : Formulation table

Sr no	Ingredient	F1	F2	F3
1	Turmeric extract	1g	2g	3g
2	Neem extract	1g	2g	3g
3	Tulsi extract	1g	2g	3g
4	Gotu kola extract	1g	2g	3g
5	Beeswax	8g	8g	8g
6	Methyl paraben	0.2g	0.2g	0.2g
7	Liquid paraffin	26.5	20.5	14.5
8	Rose water	0.3	0.3	0.3
9	Total	40g	40g	40g

Evaluation

The formulated polyherbal wound healing ointment are evaluated for the following parameter.

- Organoleptic properties
- PH
- Spreadability
- Washability
- Irritancy (15)

Evaluation of Polyherbal wound healing ointment

1. Organoleptic properties

Organoleptic evaluation refers to assessing a product based on the senses: Appearance, colour, odour, taste, and texture. It is important for determining its quality, acceptability, and potential application.

Consistency : Homogeneous without lumps or phase separation.

Colour : Natural wound healing ointment are usually yellowish, brownish, and slightly milky white.

Odor : aromatic or slightly pungent

Texture : soft non – gritty

2. Measurement of PH

Weight about 1 g of ointment, dissolve or disperse it in 100 ml of distilled water or suitable solvent. Heat slightly if necessary to form a uniform dispersion. Calibrate the Ph meter using standard buffer solution immerse the electrode of pH meter into the ointment dispersion, allow the reading to stabilize. Record the PH value, the result where shown in table.

3. Spreadability test

The small quantity of ointment is taken on fingertip, apply it gently on the back of your hand, spread it using light circular motion. Then observing the ease of spreading, presence of grittiness, uniformity of layer.



Fig no 8: spreadability test

4. Washability test

After a specific time attempt to remove the ointment using a controlled amount of water, soap, or detergent, depending on the testing condition.

Measure washability after washing, measure how much of the ointment is removed and what residue are left. The effectiveness of removal can be rated on a scale.



Fig no 9 : washability test

5. Irritancy test

Choose a small area of skin (e.g. back of hand) clean the area with water or alcohol and allow it to dry. Apply small quantity of ointment on the selected area. Spread gently to form a thin film, observe the area for a specific time interval. Parameter to be observed redness, swelling, itching or irritation, burning sensation.

4. RESULT AND DISCUSSION:

The polyherbal wound healing ointment was prepared and subjected to evaluation of the various parameter. The polyherbal ointment was pale yellowish white in colour and translucent in appearance and had a cool and smooth felling on the application. Ph also maintained constant throughout the study which was found to be 5.8 to 5.7 and the ointment was non irritant upon application on the skin.

Evaluation of formulated ointment

1. Organoleptic properties

The polyherbal ointment exhibit the organoleptic properties attributes that can be perceived by the senses making a valuable ingredient in pharmaceutical application.

Table no 3 : organoleptic properties of ointment

Organoleptic properties	F1	F2	F3
Physical state	Semi solid	Semi solid	Solid
Colour	Yellowish white	Yellowish white	White
Odour	Odourless	Odourless	Odourless
Texture	Soft	Soft	Hard
Phase separation	Absent	Present	Absent

Discussion

The physical evaluation parameter conforms that the ointment posses the desirable characteristic for topical application of batch 1, the second batch shows the phase separation and the third batch became hard in appearance and application.

2. Measurement of PH**Result****Table no 4 : Measurement of PH**

Formulation	F1	F2	F3
PH	5.8	6.2	5.7

Discussion

The ph of all prepared formulation ranged from 5.7 – 5.8 .

The ph of the formulation was within the acceptable skin range indicating that it is not irritating and compatible with skin physiology except batch number three.

3. Spreadability test**Result****Table no 5 : spreadability study**

Formulation	F1	F2	F3
Spreadability	5.2	5.1	3.1

Discussion

Spreadability refers to how easily a ointment spread on a surface, including a ease of application. Higher spreadability value means easier application. All the batches shows acceptable spreadability except batch three where batch one show higher spreadability. Indicating slightly better ease of application.

4. Washability test**Result****Table no 6 : washability study**

Formulation	F1	F2	F3
Washability	85 %	70 %	80 %

Discussion

Batch F1 shows good washability indicating suitable base for easy removal.

Batch F2 shows poor washability due to its oily nature which makes it difficult to remove.

Batch F3 shows difficult wash due to its hardness nature.

5. CONCLUSION:

By using specific medicinal plants including neem (*Azadirachta indica*), tulsi (*Ocimum sanctum*), turmeric (*Curcuma longa*), and gotu kola (*Centella asiatica*), the current study effectively developed and assessed a polyherbal wound healing ointment. These herbs were selected because of their proven antibacterial, anti-inflammatory, antioxidant, and wound-healing qualities.

The synthesized ointment demonstrated adequate physicochemical properties, such as a pleasant appearance, a smooth texture, homogeneity, and a pH that was appropriate for skin application. The formulation is safe for topical use because it is easy to apply, sufficiently removable, and non-irritating, according to evaluation characteristics including spreadability, washability, and irritancy.

By limiting microbial infection, lowering inflammation, and encouraging tissue regeneration and collagen synthesis, the synergistic action of several herbal substances improved wound healing activity.

The batch F1 performed better than the other batches in terms of overall evaluation metrics and consistency. The study shows that polyherbal formulations can be a viable, affordable, and secure substitute for traditional synthetic wound-healing agents.

The created polyherbal wound healing ointment has a great deal of therapeutic potential, and more clinical research is advised to confirm its effectiveness on a bigger scale.

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