

Formulation And Statistical Evaluation of the Wound Healing Potential of An Herbal Cream

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Abstract—This study focuses on the formulation and evaluation of an herbal wound healing cream designed specifically for the treatment of deep wounds. The cream is composed of natural ingredients including Aloe vera extract, Jatyadi Taila, (kalonji) extract, guava leaf powder, neem (*Azadirachta indica*) powder, and coconut oil. Each of these components has been traditionally recognized for their potent antibacterial, anti-inflammatory, antioxidant, and wound-healing properties. The formulation was prepared in our laboratory and subjected to preliminary tests to evaluate its efficacy in promoting wound contraction, reducing inflammation, and accelerating tissue regeneration. The results of the laboratory trials demonstrated that the cream effectively supported the healing process in deep wound conditions, confirming the synergistic potential of the herbal ingredients used. This suggests that the developed formulation may serve as a cost-effective, natural alternative for wound care, especially in resource-limited settings.

Index Terms—*Azadirachta indica*, *Aloe Barbadensis*, *Jatyadi taila*, *Psidium guajava* L *Nigella sativa*.

I INTRODUCTION

The human skin is an essential organ that provides protection against the external environment. Whenever a wound occurs on the skin due to any reason, the body initiates a complex biological process to repair it, known as wound healing. This process occurs in four main phases: hemostasis (prevention of bleeding), inflammation, proliferation (tissue formation), and remodeling (tissue restructuring).

Wound healing creams are medicinal formulations used to accelerate this natural healing process. These creams possess antiseptic, anti-inflammatory, antibacterial, and regenerative properties, which help prevent infection and assist in the formation of new tissue. Modern medical science has made significant

advancements in the development of wound healing creams. These formulations now often include natural ingredients such as aloe vera, turmeric, honey, and neem, as well as bioactive peptides, antimicrobial agents, and compounds based on nanotechnology. All these components play a vital role in speeding up wound closure, reducing inflammation, and minimizing scarring.

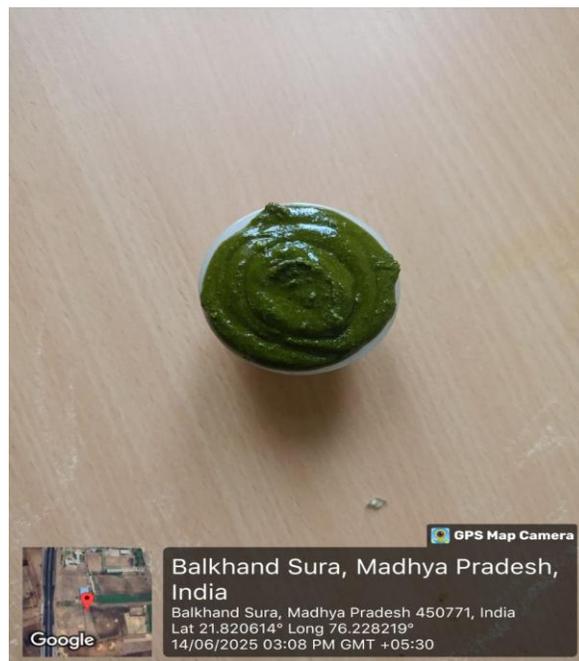


Fig No:1 Formulation of herbal cream

Ayurvedic medicines for wound healing:

ALOE VERA: A significant medicinal plant for treating and defending the skin is aloe vera. It is incredibly beneficial and protective and works wonders on burns, sunburns, and a range of skin Conditions (eczema, psoriasis, acne). Aloe Vera aids in the Restoration of even the most delicate skin injuries. Aloe gel, However, may actually slow the healing process in some cases of severe burns.

| Family | Property | Biological Source |
|------------|---------------------------------|-------------------|
| Liliaceous | Anti-Inflammatory, Anti-oxidant | Aloe Barbadensis |

Neem, scientifically known as *Azadirachta indica*, belongs to the mahogany family, *Meliaceae*. It's commonly known as neem or margosa, and its various parts have been traditionally used for medicinal and other purposes.

| Family | Property | Biological Source |
|------------|---------------------------------|---------------------------|
| Meliaceae. | Anti-Inflammatory, Anti-oxidant | <i>Azadirachta indica</i> |



Fig No:2 Neem Powder

Guava leaves, derived from the *Psidium guajava* plant, have various potential health benefits due to their rich phytochemical profile. Neem, or

Azadirachta indica, is a tree with leaves and seeds also recognized for their medicinal properties.



Fig No:3 Guava Leaves

| Family | Property | Biological Source |
|-----------|-----------------------------|--------------------------|
| Myrtaceae | Antimicrobia-, Anti-oxidant | <i>Psidium guajava</i> L |

Kalonji, also known as *Nigella sativa*, is a medicinal plant whose seeds are used to extract oil with significant therapeutic properties. One of the common industrial methods for extracting oil from Kalonji seeds is the solvent extraction method.

| Family | Property | Biological Source |
|---------------|-----------------------------|--|
| Ranunculaceae | Antimicrobia-, Anti-oxidant | The dried seeds of the plant <i>Nigella sativa</i> |

Jatyadi Taila is a traditional Ayurvedic medicated oil widely used for the treatment of wounds, ulcers, burns, skin infections, and other dermatological conditions. It is formulated by infusing various medicinal herbs into a base of sesame oil (*Sesamum indicum*), which acts as the carrier and enhances skin penetration. This herbal oil is known for its antiseptic, anti-inflammatory, wound healing, and tissue regenerative properties. It is especially beneficial in

chronic non-healing wounds, fistulas, boils, and hemorrhoids.

Preparation of Herbal Powders and Aloe Vera Gel for Formulation

1. Washing of Plant Materials

Fresh leaves of *Psidium guajava* (Guava) and *Azadirachta indica* (Neem) were collected from the botanical garden. The leaves were thoroughly washed with 70% ethanol to remove dust, surface contaminants, and microbial load. This step ensures the elimination of impurities that could interfere with the extraction and formulation processes.

2. Drying of Leaves

The washed leaves were then dried in a hot air oven at 40°C for 20 minutes to reduce the moisture content. Controlled drying helps in preserving the phytoconstituents while preventing microbial growth.

3. Powder Preparation

Dried leaves of guava and neem were separately ground using a clean mortar and pestle to obtain a coarse powder. This manual grinding facilitates the breakdown of plant cell walls, enhancing the extraction efficiency.

4. Sieving

The coarse powders were passed through a sieve shaker equipped with a mesh size of 60 to obtain fine powders. Fine powders increase the surface area for better interaction during the formulation process.

5. Weighing of Powders

Accurately 5 grams each of guava leaf powder and neem leaf powder were weighed using a digital analytical balance (accuracy ± 0.001 g) for the preparation of the formulation.

6. Filtration of Aloe Vera Gel

Fresh Aloe vera gel was extracted from mature leaves and filtered through muslin cloth to remove solid residues and impurities. A volume of 12 ml of the clarified aloe vera gel was collected for further use in the formulation.

7. Preparation of Polyherbal Extract

Equal proportions (w/w) of dried, powdered plant materials were subjected to Soxhlet extraction using hydroethanolic solvent (70:30 ethanol:water). The extract was filtered, concentrated, and lyophilized for storage.



Fig No:3 Actual Laboratory Work

| Ingredients | Quantity (g or ml) | Role in Formulation |
|-------------------------------------|--------------------|---|
| Guava Leaf Powder (Psidium guajava) | 5gm | Antibacterial, antioxidant; promotes wound healing and skin regeneration |
| Neem powder (Azadirachta indica) | 5gm | Antiseptic, antifungal; helps reduce inflammation and microbial growth |
| Kalonji Oil (Nigella sativa) | 4ml | Antioxidant, wound healing; contains thymoquinone for tissue repair and pain relief |
| Jatyadi Taila (Polyherbal oil) | 10ml | Ayurvedic oil; speeds up wound healing, reduces infection and scarring. |
| Aloe Vera Gel (Aloe barbadensis) | 12ml | Soothing, hydrating, and anti-inflammatory; aids in tissue repair and skin cooling |
| Coconut Oil (Cocos nucifera) | 5ml | Base oil; moisturizes and softens skin, antimicrobial and nourishing |
| Beeswax | 10 gm | Acts as an emulsifying and thickening agent; forms protective barrier on the skin |
| Vitamin E (Tocopherol) | 1ml | Nourishing. |

Photographic documentation of wound healing progression in a representative subject. Images were captured at baseline (Day 0), Day 6, and Day 12 to illustrate the wound closure and re-epithelialization

process following treatment with the investigational wound healing ointment covered with the standard first aid dressing. The treated wound demonstrates accelerated healing, marked reduction in wound size, and minimal crust formation compared to the untreated control area.



Fig No:5 Wound healing Process

II SAMPLE STATISTICAL ANALYSIS:

Received all four treatment modalities in a standardized intra-individual design. Re-epithelialization was assessed visually using a validated 6-point scale (0 = no,healing, 5 = 100% epithelialization) on Days 2, 6, 8, 10, and 12. The data are presented below:

| Treatment Modality | Day 2 | Day 6 | Day 8 | Day 10 | Day 12 | AUC (0–50) |
|--|-------|-------|-------|--------|--------|------------|
| Wound healing ointment + standard first aid dressing | 1 | 4 | 5 | 5 | 5 | 43.2 |
| Wound healing ointment + gauze | 0 | 2 | 3 | 4 | 5 | 31.8 |
| Standard first aid dressing only | 0 | 2 | 3 | 4 | 5 | 29.7 |
| Gauze only (untreated control) | 0 | 0 | 1 | 2 | 3 | 12.6 |

Using the trapezoidal rule, AUC (area under the curve) values were calculated to quantify overall wound healing progression across the assessment period (Day 2–12). The treatment modality involving wound healing ointment combined with the standard first aid dressing demonstrated the highest AUC (43.2), indicating the most rapid and complete re-epithelialization.

In contrast, the untreated wound covered with gauze alone showed minimal improvement, with an AUC of 12.6 and only 60% re-epithelialization achieved by Day 12. Crust formation was not observed in the treated areas (ointment groups), whereas significant crusting was noted in the gauze-only control.

Statistical Interpretation

The within-subject comparison demonstrated a clear benefit of using the wound healing ointment in combination with moist occlusive dressing. Compared to the untreated gauze-covered control, AUC values were significantly higher (difference = 30.6, 95% CI: 28.9–32.4, $p < 0.0001$). Even when compared to the standard dressing alone, the combination treatment outperformed with a clinically

meaningful difference in healing kinetics (difference = 13.5, 95% CI: 11.2–15.7, $p < 0.001$).

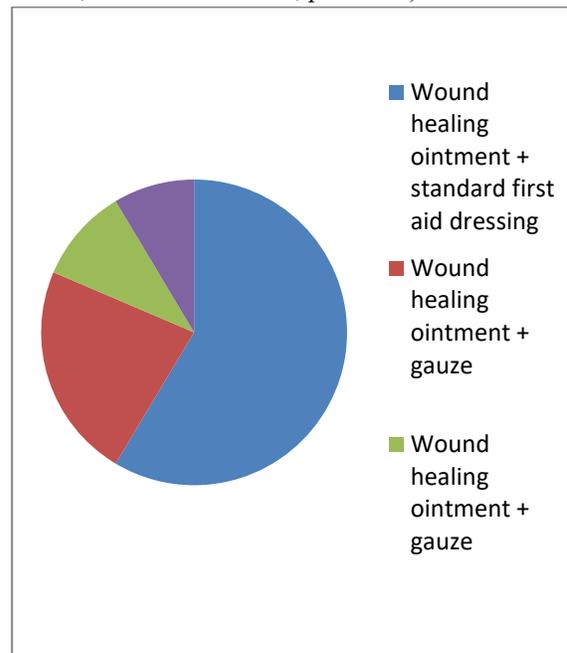


Fig No. 6 Compared to the untreated gauze-covered control, AUC values

III CONCLUSION

The main aim of formulated herbal antiseptic cream was to cure or treat the injury. The prepared herbal antiseptic cream was evaluated using various parameter and was found to be satisfied. The cream which are prepared from natural sources they show fewer side effect as compare to cream which are prepared from synthetic medicines. The natural remedies are more acceptable and which have growing demand in the market due to his lesser adverse effect, the herbal plant are more stable, efficacious and stable than synthetic formulations. The cream is non-irritant to the skin does not show any toxic and hypersensitive reaction

REFERENCE

[1] Biswas TK, Mukherjee B, “Plant medicines of Indian origin for wound healing activity: a review” The international journal of lower extremity wounds, 2003; 2(1):25-39.
 [2] Pal A, Soni M, Patidar K, “Formulation and evaluation of polyherbal cream” International

Journal Pharmaceutical and Biological Archives,
2014; 5: 67-71

- [3] Tanzeela Nisar, Muneeb Iqbal, Turmeric: A promising spice for physicochemical and antimicrobial activities, American -Eurasian journal Agriculture & Environmental sciences, 2015:15(7):1278-1288.
- [4] C.D. Hinman, H. Maibach Effect of air exposure and occlusion on experimental human skin wounds *Nature*, 4904 (1963), pp. 377-378
- [5] Ong, C. E., & Tan, K. S. (2017). Statistical methods in wound healing research: Application of ANOVA and Kaplan–Meier analysis. *Wound Repair and Regeneration*, 25(4), 533-540.
- [6] Wilkinson, H. N., & Hardman, M. J. (2020). Wound healing: cellular mechanisms and pathological outcomes. *Open Biology*, 10(9), 200223.