



FORMULATION AND EVALUATION OF POLYHERBAL TOPICAL WOUND HEALING HYDROGEL FOR DIABETIC PATIENTS

Ghausiyabanu Shaikh, Ms. Kavita Maseeh

Student At B. Pharmacy College Rampura, Assistant Professor At B. Pharmacy College Rampura, Godhra, Gujarat

Abstract: Chronic wounds, particularly diabetic ulcers, present a major therapeutic challenge due to delayed healing, high risk of infection, and impaired tissue regeneration. The present study aims to formulate and evaluate a polyherbal hydrogel as an effective topical drug delivery system for wound healing applications. The hydrogel was developed using Carbopol 940 as a gelling agent and incorporated with herbal extracts of *Azadirachta indica* and *Centella asiatica*, known for their potent antimicrobial, anti-inflammatory, and wound healing properties. Suitable excipients such as triethanolamine, glycerin, methyl paraben, and acetic acid were used to achieve the desired consistency, stability, and preservation of the formulation.

The prepared hydrogel was evaluated for various physicochemical parameters including physical appearance, pH, viscosity, spreadability, homogeneity, and drug content. The formulation exhibited a smooth and homogeneous texture with a pH suitable for skin application. Viscosity and spreadability were found to be optimal, ensuring ease of application and improved patient compliance. In vitro drug release studies demonstrated a sustained release pattern of the active constituents, which is beneficial for prolonged therapeutic action at the wound site.

The antimicrobial activity of the hydrogel indicated effective inhibition of microbial growth, supporting its role in preventing wound infections. Additionally, the formulation was found to be non-irritant and safe for topical use. Overall, the developed polyherbal hydrogel showed promising results and can be considered a potential alternative for the effective management of diabetic wounds.

I. INTRODUCTION

Diabetic wounds are among the most serious complications of diabetes mellitus due to delayed healing, microbial infection, and impaired tissue regeneration. Conventional wound dressings often fail to provide effective healing because they do not maintain adequate moisture or deliver therapeutic agents efficiently. Hydrogels have emerged as promising wound care systems due to their high water content, biocompatibility, and ability to provide sustained drug release. Herbal extracts such as *Azadirachta indica* and *Centella asiatica* possess antimicrobial, anti-inflammatory, and wound healing properties, making them suitable candidates for hydrogel formulation.

II. OBJECTIVE

The present study aimed to formulate and evaluate a polyherbal hydrogel containing *Azadirachta indica* and *Centella asiatica* for effective diabetic wound healing.

III. MATERIALS AND METHOD

The polyherbal hydrogel was prepared using Carbopol 940 as the gelling agent. Chitosan was incorporated as a bioadhesive polymer, while triethanolamine was used for neutralization. Glycerin acted as a humectant, methyl paraben as a preservative, and acetic acid as a solvent. The prepared hydrogel was evaluated for physical appearance, pH, viscosity, spreadability, homogeneity, antimicrobial activity, skin irritation, and stability.

IV. Results and Discussion

The prepared hydrogel showed smooth texture, homogeneity, acceptable pH, and good spreadability. The formulation exhibited sustained drug release and effective antimicrobial activity. Skin irritation studies confirmed its safety for topical application. Stability studies indicated no significant changes in formulation characteristics.

V. Conclusion

The developed polyherbal hydrogel demonstrated promising wound healing potential and can be considered an effective, safe, and economical topical formulation for diabetic wound management.

VI. References

1. Boateng JS, Matthews KH, Stevens HNE, Eccleston GM. Wound healing dressings and drug delivery systems: A review. *J Pharm Sci.* 2008;97(8):2892–2923.
2. Gupta A, Kowalczyk M, Heaselgrave W, Britland ST, Martin C, Radecka I. The production and application of hydrogels for wound management: A review. *Eur Polym J.* 2019;111:134–151.
3. Dash M, Chiellini F, Ottenbrite RM, Chiellini E. Chitosan—A versatile semi-synthetic polymer in biomedical applications. *Prog Polym Sci.* 2011;36(8):981–1014.
4. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological activities and medicinal properties of neem (*Azadirachta indica*). *Curr Sci.* 2002;82(11):1336–1345.
5. Shukla A, Rasik AM, Dhawan BN. Asiaticoside-induced elevation of antioxidant levels in healing wounds. *Phytother Res.* 1999;13(1):50–54.
6. Nayak BS, Pereira LP. *Catharanthus roseus* flower extract has wound-healing activity in Sprague Dawley rats. *BMC Complement Altern Med.* 2006;6:41.
7. Singla R, Soni S, Patial V, Kulurkar PM, Kumari A. Hydrogel-based drug delivery systems: A review. *Int J Pharm Sci Rev Res.* 2012;14(2):1–14.
8. Peppas NA, Bures P, Leobandung W, Ichikawa H. Hydrogels in pharmaceutical formulations. *Eur J Pharm Biopharm.* 2000;50(1):27–46.

