



REVIEW ARTICLE ON FORMULATION AND EVALUATION OF POLYHERBAL ANTIBACTERIAL SOAP

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Abstract

Skin infections caused by bacteria and fungi remain a major health concern worldwide due to poor hygiene and increasing antimicrobial resistance. Synthetic antibacterial soaps containing agents such as triclosan and triclocarban are associated with skin irritation, microbial resistance, and environmental toxicity. Polyherbal antibacterial soaps formulated using medicinal plant extracts offer a safer, eco-friendly, and effective alternative. These soaps exhibit antimicrobial, anti-inflammatory, antioxidant, and skin-protective properties. The present review discusses skin physiology, microbial infections, herbal ingredients used, formulation methods, evaluation parameters, antibacterial mechanisms, advantages, and future prospects of polyherbal antibacterial soaps.

Keywords: Poly herbal antibacterial soap, herbal cosmetics, medicinal plants, antimicrobial activity, skin infections, natural surfactants, herbal formulations, skin hygiene.

Introduction

The skin acts as the first line of defense against environmental pollutants, pathogens, and harmful chemicals [12]. Improper hygiene and microbial exposure can lead to skin disorders such as acne, eczema, dermatitis, and bacterial or fungal infections [13,14]. Soaps are widely used cleansing agents that remove dirt, excess oils, and microorganisms from the skin surface [15]. Synthetic antibacterial soaps may disrupt normal skin flora and contribute to antimicrobial resistance [4,5]. Hence, herbal and polyherbal formulations are gaining popularity due to their better safety profile, biocompatibility, and traditional acceptance [6, 16].

Structure and Functions of Skin

The skin is composed of three layers-epidermis, dermis, and hypodermis-which together provide protection, sensation, and thermoregulation [11].

Epidermis

The epidermis is the outermost layer composed of keratinized epithelial cells. It acts as a physical and

chemical barrier preventing microbial invasion and water loss [11].

Dermis

The dermis consists of connective tissue, blood vessels, nerves, hair follicles, sweat glands, and sebaceous glands. It provides mechanical strength and nourishment to the skin [12].

Hypodermis

The hypodermis contains adipose tissue and connective tissue that provide insulation, cushioning, and attachment to underlying tissues [11].

Skin Infections and Role of Antibacterial Soaps

Skin infections are commonly caused by microorganisms such as *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, and fungal species [13,17]. Antibacterial soaps reduce microbial load and help prevent infection transmission [14]. Herbal antibacterial soaps selectively eliminate pathogenic microbes while maintaining beneficial skin microbiota [18].

Herbal Cosmetics and Polyherbal Concept

Herbal cosmetics are products formulated using plant-based ingredients to improve skin health and appearance [6]. The polyherbal concept is based on synergistic action, where multiple herbs enhance therapeutic efficacy and reduce toxicity [16,19]. Polyherbal formulations provide enhanced antibacterial activity, reduced side effects, improved stability, and better patient compliance [16].

Medicinal Plants Used in Polyherbal Antibacterial Soaps

Azadirachta Indica (Neem)

Neem exhibits strong antibacterial, antifungal, and antiviral activities due to bioactive compounds such as nimbin and azadirachtin [8].

Curcuma Longa (Turmeric)

Curcumin possesses potent antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties, making it useful in skin formulations [9].

Ocimum Tenuiflorum (Tulsi)

Tulsi contains eugenol and terpenoids that provide antibacterial, antioxidant, and immunomodulatory effects [10].

Aloe Barbadensis (Aloe Vera)

Aloe vera gel exhibits moisturizing, soothing, wound-healing, and antimicrobial activities beneficial for skin care products [11,17].

Honey

Honey acts as a natural humectant and exhibits antibacterial activity due to osmotic effects and hydrogen peroxide release [20].

Formulation of Polyherbal Antibacterial Soap

Polyherbal soaps are commonly prepared by the cold process method or melt-and-pour method [6].

Cold Process Method

This method involves saponification of oils with sodium hydroxide followed by incorporation of herbal extracts at low temperatures to preserve phytoconstituents.

Melt and Pour Method

A pre-saponified soap base is melted and mixed with herbal extracts, essential oils, and additives. This method is safer and suitable for laboratory-scale preparation [6].

Evaluation Parameters

Physicochemical Evaluation

Parameters include pH, foam height, foam retention, moisture content, free alkali content, and total fatty matter (TFM) [20].

Stability Studies

Stability studies assess physical appearance, pH, and consistency under different storage conditions to ensure product quality.

Antibacterial Activity

Antibacterial activity is evaluated using agar well diffusion or disc diffusion methods by measuring zones of inhibition against test organisms [18].

Mechanism of Antibacterial Action

Herbal extracts exert antibacterial action by disrupting microbial cell membranes, inhibiting enzyme activity, interfering with protein synthesis, and preventing microbial adhesion [18, 19]. Synergistic interactions among multiple herbs enhance antimicrobial efficacy.

Advantages of Polyherbal Antibacterial Soap

Polyherbal antibacterial soaps are biodegradable, non-toxic, skin-friendly, cost-effective, and suitable for long-term use without causing microbial resistance [6,20].

Future Prospects

Increasing consumer demand for natural and sustainable products has expanded the market for polyherbal antibacterial soaps. Further research on standardization, quality control, and clinical evaluation is required to enhance their pharmaceutical and cosmetic applications [1].

Conclusion

Polyherbal antibacterial soaps provide a safe, effective, and eco-friendly alternative to synthetic antibacterial soaps. The synergistic combination of medicinal herbs offers enhanced antimicrobial activity, skin nourishment, and minimal adverse effects, making them ideal for maintaining skin hygiene and preventing infections [6,16].

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Author contributions

All authors are contributed equally.

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