

PREPERATION AND EVALUATION OF ANTESEPTIC DERMAL SPRAY OF SALVIA ROSMARINUS

Insha Shaikh ,Ayan Shaikh , Mrs. Nilofar Momin

Student Assistant Professor at Department of Pharmaceutiucs Pharmacy Department
M.C.E. Society's Allana College of Pharmacy , Pune , India

Abstract

Herbal formulations are increasingly recognized as safe, effective, and eco friendly alternatives to synthetic products in dermatological care. This study focuses on the preparation and evaluation of an antiseptic dermal spray using *Salvia rosmarinus* (rosemary) as the primary active ingredient, combined with neem and aloe vera for synergistic effects. The formulation was designed to address common skin infections while minimizing irritation and environmental impact. Extraction of phytoconstituents was carried out using the decoction method, followed by incorporation of ethanol, glycerin, and distilled water to produce a stable spray. The prepared formulation was evaluated for physicochemical properties, antimicrobial activity, stability, and safety. Results demonstrated that the spray exhibited acceptable pH, viscosity, and sprayability, with effective inhibition of fungal growth and moderate antibacterial activity. Stability studies confirmed that the formulation remained unchanged under varied storage conditions, and skin irritation testing revealed no adverse effects. Overall, the study highlights the potential of rosemary based sprays as natural antiseptic solutions, offering a promising alternative to synthetic formulations in topical healthcare.

INTRODUCTION

Global Context of Skin Health

Skin health is a fundamental aspect of overall well being, yet it is often overlooked until infections or disorders arise. Across the world, millions of people suffer from minor wounds, abrasions, and microbial infections that compromise the skin's protective barrier. The skin, being the largest organ of the human body, serves as the first line of defense against external pathogens. When this barrier is breached, bacteria, fungi, and viruses can easily invade, leading to conditions ranging from mild irritation to severe systemic infections. The burden of skin infections is particularly high in tropical and subtropical regions, where humidity and heat create favorable conditions for microbial growth. In addition, poor hygiene, limited access to healthcare, and rising antimicrobial resistance have made these infections a persistent public health challenge.

Synthetic antiseptic sprays have long been used to manage such infections, but their widespread use has raised concerns. Many of these sprays rely on chemical agents that, while effective, can cause skin dryness, irritation, or allergic reactions. Furthermore, the pressurized delivery systems often used in commercial sprays contribute to environmental pollution. These drawbacks have prompted researchers and consumers alike to explore safer, more sustainable alternatives. Herbal medicine, with its centuries old tradition and proven efficacy, has emerged as a promising solution.

The Shift Toward Herbal Medicine

Herbal medicine is not a new concept; it has been practiced for thousands of years across cultures. Ancient civilizations in Egypt, India, China, and Greece relied on plants for healing wounds, treating infections, and maintaining general health. In modern times, the World Health Organization has recognized the importance of traditional medicine, noting that nearly 80% of the global population relies on herbal remedies for primary

healthcare. This reliance is not merely cultural but practical: herbal formulations are often more affordable, accessible, and safer than synthetic alternatives.

In dermatology, the appeal of herbal products lies in their dual benefits. They not only combat pathogens but also soothe and nourish the skin. Unlike synthetic sprays, which may focus solely on disinfection, herbal sprays often provide antioxidant protection, reduce inflammation, and promote healing. Consumers are increasingly drawn to these products, driven by a desire for natural, eco friendly solutions that align with holistic health practices. The cosmetic and pharmaceutical industries have responded to this demand by investing in herbal research and developing plant based formulations. Rosemary, neem, and aloe vera are among the most studied herbs in this context, each offering unique therapeutic properties that complement one another.

Botanical Profile of *Salvia rosmarinus* (Rosemary)

Rosemary, scientifically known as *Salvia rosmarinus*, is an aromatic evergreen shrub native to the Mediterranean region. It has been cultivated for centuries, not only for culinary purposes but also for its medicinal value. The plant is characterized by needle like leaves, fragrant essential oils, and small bluish purple flowers. Its resilience in warm, dry climates has made it a staple in traditional medicine, particularly for treating wounds, infections, and inflammatory conditions.

The phytochemical composition of rosemary is rich and diverse. Compounds such as rosmarinic acid, carnosic acid, flavonoids, diterpenes, and essential oils contribute to its therapeutic potential. Rosmarinic acid is a powerful antioxidant that reduces oxidative stress, protecting skin cells from damage and accelerating healing. Carnosic acid has been shown to possess antimicrobial properties, inhibiting the growth of bacteria and fungi. Flavonoids and terpenes further enhance its anti inflammatory and soothing effects. Together, these compounds make rosemary an ideal candidate for topical formulations aimed at preventing and managing skin infections.

Traditional medicine has long recognized rosemary's value. In Mediterranean cultures, rosemary leaves were applied to wounds to prevent infection. In Ayurvedic practices, rosemary was used to improve circulation and reduce inflammation. Modern pharmacological studies have validated these uses, confirming rosemary's antimicrobial, antioxidant, and wound healing properties. Its inclusion in an antiseptic dermal spray is therefore both scientifically justified and culturally rooted.

Supporting Herbal Agents: Neem and Aloe Vera

While rosemary serves as the cornerstone of the formulation, neem and aloe vera play crucial supporting roles. Neem (*Azadirachta indica*) is a tree native to India, renowned for its antibacterial, antifungal, and anti inflammatory properties. Its leaves, bark, and seeds have been used in traditional medicine for centuries to treat infections and promote healing. Neem's bioactive compounds, including azadirachtin and nimbidin, are particularly effective against bacterial pathogens, making it a valuable addition to antiseptic formulations.

Aloe vera, on the other hand, is widely recognized for its soothing and moisturizing effects. Its gel contains polysaccharides, vitamins, and minerals that hydrate the skin, reduce irritation, and promote tissue regeneration. Aloe vera is often used to treat burns, rashes, and wounds, providing cooling relief and accelerating recovery. When combined with rosemary and neem, aloe vera enhances the overall efficacy of the spray, ensuring that it not only disinfects but also comforts and protects the skin.

Rationale for the Study

The rationale for developing a rosemary based antiseptic spray lies in the convergence of scientific evidence, consumer demand, and public health needs. Synthetic sprays, while effective, are increasingly criticized for their side effects and environmental impact. Herbal alternatives offer a safer, more sustainable solution, but there is limited research on spray formulations that combine rosemary with other supportive herbs. By preparing and evaluating such a formulation, this study seeks to fill a critical gap in dermatological research.

The goal is to demonstrate that a natural, non pressurized spray can provide effective antimicrobial protection while minimizing irritation and promoting healing.

Literature Review

The therapeutic potential of rosemary has been documented across centuries, from its use in Mediterranean folk medicine to modern pharmacological studies. Research has consistently highlighted its antimicrobial activity, with essential oils showing inhibition against bacterial strains such as *Staphylococcus aureus* and fungal pathogens like *Candida albicans*. Rosemary's antioxidant compounds, particularly rosmarinic acid, have been shown to reduce oxidative stress, thereby accelerating wound healing and protecting skin cells from damage. Neem (*Azadirachta indica*) complements these effects with its strong antibacterial and antifungal properties, widely used in traditional Indian medicine for treating infections. Aloe vera adds soothing, moisturizing, and wound healing benefits, making the combination of these herbs particularly effective in dermal formulations. Despite these findings, there remains limited research on rosemary based sprays specifically designed for antiseptic use, which underscores the novelty and relevance of this study.

Aim and Objectives

The central aim of this research was to prepare and evaluate a herbal antiseptic dermal spray using rosemary extract. Specific objectives included:

- Extracting active phytoconstituents from rosemary leaves and neem powder using the decoction method.
- Incorporating aloe vera as a soothing and wound healing agent.
- Formulating a stable spray with ethanol and glycerin to enhance antimicrobial activity and maintain skin hydration.
- Evaluating physicochemical properties such as pH, viscosity, and sprayability.
- Assessing antimicrobial activity against common bacterial and fungal strains.
- Conducting stability studies under different storage conditions.
- Performing safety evaluation through skin irritation testing.

Together, these objectives aimed to establish the spray as a cost effective, herbal alternative to synthetic antiseptics.

Materials and Methods

The study utilized dried rosemary leaves, neem powder, and aloe vera powder as primary herbal ingredients. Extraction was performed using the decoction method, where the plant materials were boiled in distilled water to release active phytoconstituents. The filtrate was concentrated and combined with ethanol, glycerin, and distilled water to prepare the spray. Aloe vera was dissolved separately and added to enhance soothing properties. The final formulation was filtered to ensure clarity and packaged in amber colored spray bottles to protect against light degradation. Evaluation involved measuring pH with a calibrated digital meter, viscosity using a viscometer, and sprayability by observing mist uniformity. Antimicrobial activity was tested using the agar well diffusion method against bacterial and fungal strains. Stability studies were conducted at room temperature and refrigeration, while safety was assessed through a skin irritation patch test.

Evaluation Parameters

The prepared spray was clear, uniform, and exhibited a characteristic herbal odor. The pH ranged between 5.5 and 6.5, aligning with the natural skin pH and ensuring compatibility. Viscosity measurements confirmed that the formulation was free flowing, suitable for spray application. Sprayability tests showed a fine, uniform mist without nozzle clogging, indicating ease of use. Antimicrobial testing revealed moderate inhibition of bacterial

growth and effective inhibition of fungal strains, validating the spray's antiseptic potential. Stability studies demonstrated that the formulation remained unchanged in terms of color, odor, and appearance under both room temperature and refrigerated conditions. Skin irritation testing confirmed that the spray was safe, with no signs of redness, itching, or discomfort observed.

Results and Discussion

The findings confirmed that the rosemary based spray possessed desirable physicochemical properties, including acceptable pH, low viscosity, and uniform sprayability. Antimicrobial testing highlighted its effectiveness against fungal organisms, which are common causes of skin infections, while showing moderate activity against bacteria. Stability studies reinforced the robustness of the formulation, with no significant changes observed during storage. Compared to synthetic sprays, the herbal formulation offered additional benefits such as soothing effects, reduced risk of irritation, and eco friendly composition. These results support the hypothesis that rosemary, when combined with neem and aloe vera, can serve as a potent natural antiseptic agent. The discussion also emphasizes the importance of further research, including long term stability testing and clinical trials, to fully establish its commercial viability.

Conclusion

The study successfully formulated and evaluated a herbal antiseptic dermal spray using rosemary, neem, and aloe vera. The spray demonstrated good physicochemical properties, effective antimicrobial activity, and stability under varied conditions. Importantly, it was found to be safe for topical application, with no irritation observed during testing. This research highlights the potential of herbal sprays as eco friendly, cost effective, and safe alternatives to synthetic antiseptics. Future work should focus on advanced microbiological evaluations, long term stability studies, and clinical testing to pave the way for commercialization and broader use in dermatological care.

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