Abstract 37 – Paper ID: 058

Development and Evaluation of a Topical Formulation of Azelaic Acid and Rosemary Essential Oil for the Treatment of Acne Vulgaris

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Abstract

Acne vulgaris affects over 20% of individuals aged 16 and above, with peak prevalence (28.3%) among those aged 16–24 years. Globally, cases have surged from 132 to 184 million, with India contributing over 30 million.

Acne vulgaris is one of the most common chronic inflammatory skin diseases of the pilosebaceous unit characterized by comedones, papules, pustules, and acne scars. The main pathogenic mechanisms of the disease, i.e., follicular hyperkeratinization, seborrhea, proliferation of *Cutibacterium acnes*, and inflammation, determine the treatment regimens. The use of traditional drugs in the treatment of acne is often accompanied by symptoms such as dry skin, irritation, and resistance to microbial agents, thereby necessitating the search for better alternatives.

This article reviews the therapeutic potential of a topical azelaic acid and rosemary essential oil combination in acne management. Azelaic acid confers antimicrobial, anti-inflammatory, and keratolytic effects, and rosemary essential oil delivers antioxidant, antibacterial, and sebum-regulating activities through its bioactive molecules such as cineole, camphor, and α-pinene. The formulation is intended to improve skin-targeted delivery, effectiveness, and patient compliance with less toxicity.

Overall, the therapeutic use of azelaic acid in combination with rosemary essential oil represents a natural, patient-friendly, and promising strategy for acne management. This combination effectively targets both microbial and inflammatory pathways while enhancing the cosmetic appearance and overall treatment outcome.

Keywords: Acne vulgaris, azelaic acid, rosemary essential oil, *Cutibacterium acnes*, topical combination therapy, anti-inflammatory and antimicrobial activity

ISBN: 978-81-989164-2-6; DOI: 10.21467/abstracts.8.1