

Extended Abstract

GoldClear® Anti-acne Patch: Harnessing Natural Efficacy with Modern Drug Delivery for Acne Care

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ABSTRACT

Acne vulgaris is a common skin condition that affects millions worldwide, often leading to physical discomfort and psychological distress. Conventional treatments, typically in cream or gel form, can be sticky, unpleasant, and easily washed off, which reduces effectiveness and user compliance and potentially contributes to resistance issues. In recent years, natural plant extracts have gained popularity as alternative therapeutic agents due to their safety profile and multiple bioactive properties. This study focuses on developing an anti-acne patch, GoldClear®, infused with *Allamanda cathartica* (golden trumpet) leaf extract. The GoldClear® extract demonstrated rich phytochemical constituents, high efficacy, low cytotoxicity, and a favourable selectivity index, ensuring safe application on the skin. Incorporating this extract into a patch allows targeted delivery, enhancing its therapeutic action and minimizing systemic exposure. The *in vitro* study revealed that the GoldClear® patch exhibits potent bactericidal activity against *Propionibacterium acnes*, a key pathogen implicated in acne development, showing effectiveness comparable to tea tree oil gel. These findings highlight the potential of GoldClear® as a natural and effective solution for acne management, offering an innovative, patient-friendly approach that leverages botanical extracts with modern drug delivery systems.

Keywords: Acne vulgaris, *Allamanda cathartica*, botanical extract, patch, *Propionibacterium acnes*

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1.0 Introduction

The persistent challenge of acne vulgaris, a chronic multifactorial inflammatory condition, remains the second-highest contributor to the global burden of skin diseases, particularly among teenagers and young adults (1). Conventional treatments, such as topical creams and gels, often contain synthetic ingredients that may cause skin irritation, dryness, and an unpleasant sticky texture and are easily washed off, diminishing their efficacy (2). Inconsistent use further contributes to drug resistance and treatment failure (3). In response to these challenges, GoldClear® Anti-Acne Patch was developed as a natural alternative with potent antimicrobial properties. The patch represents an innovative advancement in healthcare and consumer goods, offering a more effective and convenient acne management solution. In addition to its therapeutic benefits, GoldClear® features a design inspired by the *Allamanda cathartica* flower, aimed at enhancing patient compliance, particularly in adolescent populations. The visually appealing patch serves its primary function as an anti-acne treatment and acts as a discreet and fashionable accessory, potentially improving user adherence by addressing concerns related to the social and psychological impact of acne. By integrating the aesthetic appeal with advanced drug delivery technology, GoldClear® provides a plant-based skincare solution that is both effective and user-friendly, potentially leading to better clinical outcomes through improved patient engagement and consistent usage. This study aims to highlight the significance of GoldClear® in advancing acne treatment and

its potential as a natural and innovative approach to skincare.

2.0 Innovation

GoldClear® an anti-acne patch infused with *A. cathartica* extract (Figure 1A), is enriched with bioactive compounds such as coumarins, phenols, flavonoids, terpenoids, and saponins (4). The extract exhibits high total phenolic (36.22 ± 2.91 mg GAE/g) and flavonoid (12.29 ± 2.25 mg CAE/g) content, which are key contributors to its bioactivity (Figure 1B). GoldClear® was evaluated for its efficacy and safety profile, revealing a median cytotoxic concentration (CC₅₀) of 704.66 ± 7.84 µg/mL on normal human foreskin, BJ fibroblast cell line (ATCC®CRL-2522), indicating low cytotoxicity and safe application on the skin. Additionally, the extract demonstrated a median inhibitory concentration (IC₅₀) of 49.036 µg/mL against *Propionibacterium acnes* (ATCC®-6919), the primary bacterium implicated in acne pathogenesis (Figure 1C). This results in a high selectivity index (SI) of 14.4, signifying that GoldClear® can effectively target *P. acnes* with minimal toxicity to human skin cells.

Figure 2 shows that GoldClear® demonstrated a significantly higher zone of inhibition (28.88 ± 5.52 mm) against *P. acnes* compared to the Tea Tree Oil gel (22.48 ± 3.92 mm). This indicates that GoldClear® possesses superior antibacterial properties, making it a more effective option for targeting acne-causing bacteria. Moreover, the design of GoldClear®, inspired by the golden trumpet flower, not only appeals aesthetically but also serves a functional purpose in enhancing treatment efficacy.

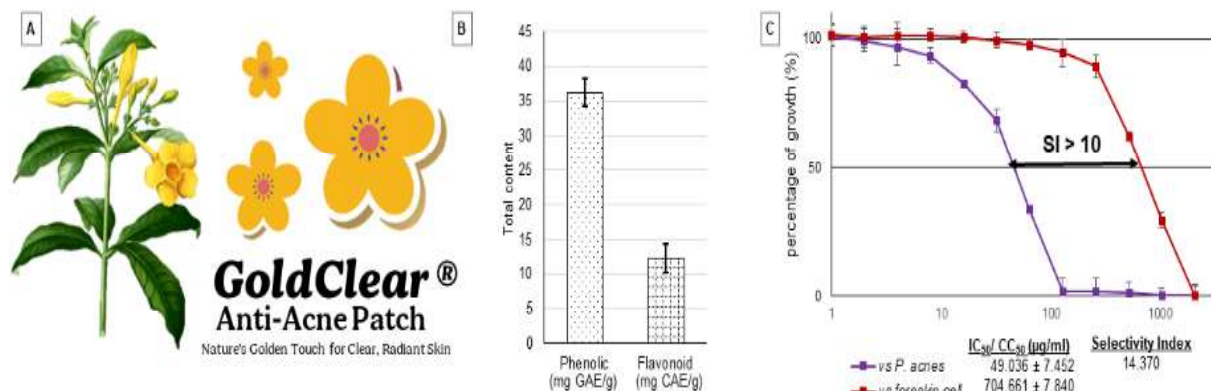


Figure 1: Phytochemical screening and bioactivity of *A. cathartica* extract. (A) Illustration of the plant and the inspired patch design, (B) Quantification of phenolic and flavonoid content, (C) Cytotoxicity and anti-acne activity with a selectivity index (SI) of the plant extract.

As illustrated in Figure 2B, the patch is hypothesised to provide targeted and sustained delivery of the active anti-acne compounds directly to the affected skin layers. This targeted delivery system ensures that the antimicrobial agents penetrate the skin more effectively than conventional topical drug delivery like cream or gel, which are prone to be washed off and may have reduced efficacy over time.

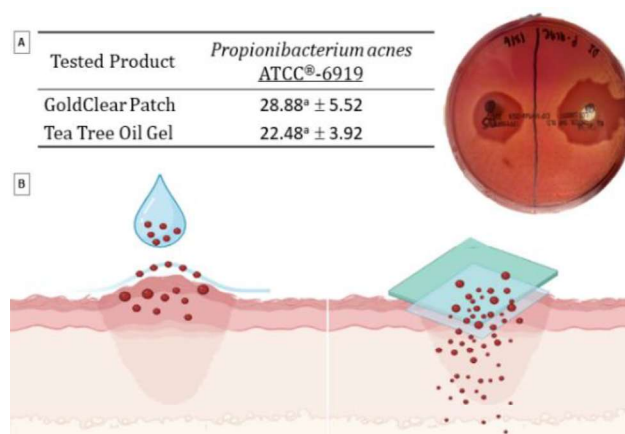


Figure 2: The product efficacy and mechanism of absorption. (A) The disc diffusion study, (B) The comparison of traditional drug delivery with patch mechanism of delivery.

"a" value within a column with the same superscripts are not significantly different from each other at $p > 0.05$.

3.0 Uniqueness

GoldClear® Anti-Acne Patch uniquely combines *Allamanda cathartica* extract, rich in anti-acne compounds, with an advanced drug delivery system. Its hydrocolloid patch ensures targeted and sustained delivery to the skin, outperforming traditional drug delivery like cream or gel. Inspired by the golden trumpet flower, the patch's design enhances user compliance, especially among teenagers. By providing a stylish, effective, and natural acne treatment option, GoldClear® addresses both therapeutic and psychological aspects, offering a safer alternative with reduced risk of resistance and side effects compared to synthetic treatments. This novel approach bridges natural remedies and modern skincare technology.

4.0 Commercialisation Potential

The product appeals to the growing market for plant-based skincare solutions, meeting consumer demand for safe, effective, and aesthetically pleasing treatments. Its unique formulation and design address the limitations of conventional acne treatments,

such as irritation, stickiness, and wash-off issues, making it attractive to teenagers and young adults. The product can be marketed through various channels, including pharmacies, skincare clinics, and online platforms. With increasing interest in natural and sustainable skincare, GoldClear® is well-positioned for global market entry.

5.0 Impact on Quintuple Helix

It advances scientific research in natural skincare, offering a marketable product that meets consumer demand for safe, effective treatments. This aligns with public health initiatives, potentially reducing healthcare burdens. Raising awareness of natural skincare options encourages healthier lifestyle choices and sustainable practices. Additionally, its use of botanical ingredients minimizes environmental impact compared to synthetic chemicals, promoting eco-friendly solutions. GoldClear® fosters collaboration across these sectors, offering societal and environmental benefits through an innovative, holistic approach.

6.0 Conclusion

GoldClear® bridges the gap between natural product efficacy and advanced drug delivery technology, positioning it as a novel and effective solution in the evolving landscape of acne care.

Authorship contribution statement

AZZ: Data analysis, Methodology, Formal analysis, Writing—original draft. **MHH:** Visualization, Methodology, Writing – review & editing. **MM, KAH, AHJ:** Visualization, Draft corrections. **MFM:**

Supervision, Funding acquisition, Writing – review & editing.

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Conflict of Interest

The authors declared that they have no conflicts of interest to disclose.

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