



SENNA ALATA (RINGWORM BUSH): A REVIEW ON ITS PHYTOCHEMISTRY AND PHARMACOLOGIC ACTIVITIES

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DOI: <https://doi.org/10.5281/zenodo.20524047>

How to cite this Article: Shosi Mari Larido^{1*}, Aisa Daring¹, Erich Anquillano¹, Fatima Zernahar Nanong¹, Erika Mae Timsan¹, John Jeric Teves¹, Gerson Balatero¹, Roselina Ladjaalih¹, Nur-Ainie Jambiran¹, Jona Mae Almadin¹, Kyle Christian Vreeland², Arkiell Dereza³. (2026). Senna Alata (Ringworm Bush): A Review on its Phytochemistry and Pharmacologic Activities. *European Journal of Biomedical and Pharmaceutical Sciences*, 13(6), 332–337.
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Article Received on 05/05/2026

Article Revised on 25/05/2026

Article Published on 01/06/2026

ABSTRACT

Senna alata (L.) Roxb., commonly known as akapulko or ringworm bush, is a medicinal plant widely recognized in tropical and subtropical regions for its diverse pharmacological activities. This review summarizes existing literature on the phytochemistry and dermatologic applications of *S. alata*, with a particular focus on its potential effectiveness in treating acne. The plant is rich in bioactive compounds such as anthraquinones, flavonoids, tannins, and phenolic compounds, which are distributed across its various parts, including leaves, flowers, roots, and seeds. These constituents contribute to its documented antifungal, antibacterial, anti-inflammatory, and antioxidant properties. Notably, the anthraquinones rhein and aloe-emodin are primarily responsible for its significant antifungal effects against pathogens like *Candida* species and dermatophytes. Its antibacterial activity targets both Gram-positive and Gram-negative bacteria, including acne-causing *Propionibacterium acnes*. Furthermore, the plant's anti-inflammatory effects, attributed to compounds like quercetin and kaempferol, involve the inhibition of COX enzymes and pro-inflammatory cytokines, making it beneficial for inflammatory skin conditions. The antioxidant activity, driven by phenolic compounds, helps mitigate oxidative stress crucial in skin health. This comprehensive review highlights *S. alata's* promising role as a natural alternative in skincare formulations, particularly for managing acne and other dermatological conditions, by identifying its key bioactive compounds and mechanisms of action.

1. INTRODUCTION

Senna alata (L.) Roxb., commonly known as akapulko or ringworm bush, is a medicinal plant belonging to the Fabaceae family. It is widely distributed in tropical and subtropical regions, including Southeast Asia, Africa, and South America. In the Philippines, *S. alata* is recognized by the Department of Health (DOH) as one of the ten approved herbal medicinal plants due to its proven antifungal properties, particularly in the treatment of skin infections such as tinea corporis (ringworm) (DOH, 2017). Traditionally, *S. alata* has been used in ethnomedicine for treating various dermatological conditions, including fungal infections, eczema, itching, and inflammation. Beyond its antifungal applications, the

plant has also demonstrated antibacterial, antioxidant, and anti-inflammatory activities, which contribute to its potential use in managing acne and other skin disorders (Sasidharan et al., 2020). Recent scientific interest has focused on the phytochemical composition of *S. alata*, identifying bioactive compounds such as anthraquinones, flavonoids, tannins, and phenolic compounds. These constituents are believed to play a significant role in its pharmacological activities, particularly in inhibiting microbial growth and reducing inflammation key factors involved in acne pathogenesis (Ajayi et al., 2021).

The objective of this review is to summarize and evaluate existing literature on the phytochemistry and

dermatologic applications of *S. alata*, with emphasis on its potential effectiveness in treating acne. This includes identifying its major bioactive compounds, mechanisms of action, and its relevance as a natural alternative in skincare formulations.

1.1 Botanical and Taxonomic Description of *Senna alata*

Senna alata is a fast-growing, perennial shrub that can reach heights of 2 to 5 meters. It is characterized by large pinnate leaves, bright yellow candle-like inflorescences, and elongated seed pods.

The plant thrives in humid, tropical climates and is commonly found in open fields, roadsides, and disturbed areas.

Taxonomically, *S. alata* is classified as follows:

- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Magnoliopsida
- Order: Fabales
- Family: Fabaceae
- Genus: *Senna*
- Species: *Senna alata*

In the Philippines, it is commonly referred to as "akapulko," while other names include ringworm bush, candle bush, and "ketepeng cina" in Indonesia. Its widespread availability and ease of cultivation contribute to its extensive use in traditional medicine.

1.2 Traditional and Dermatologic Uses of *Senna alata*

Historically, *S. alata* has been utilized in herbal medicine for its antifungal and antimicrobial properties. The leaves are commonly crushed and applied topically to treat fungal infections such as ringworm, athlete's foot, and candidiasis. Decoctions of the leaves are also used for skin cleansing and treatment of inflammatory skin conditions.

Studies have shown that *S. alata* possesses strong activity against dermatophytes such as *Trichophyton* and *Microsporum* species, which are responsible for many superficial fungal infections (Kumar et al., 2019). In addition, its antibacterial activity against acne-causing bacteria such as *Propionibacterium acnes* (now *Cutibacterium acnes*) suggests its potential as an anti-acne agent.

Table 1. Traditional and Dermatologic Uses of *Senna alata*.

Plant Part	Dermatologic Uses	References
Roots	Used as a mild antimicrobial agent and for treating skin infections and inflammation	Ajayi et al., 2017; Yakubu et al., 2020
Leaves	Applied topically to treat fungal infections such as ringworm, athlete's foot, eczema, itching, and skin inflammation	Bhat et al., 2018; Sule et al., 2021
Seeds	Reported to have antibacterial and antifungal properties; used in traditional remedies for skin diseases	Oke & Hamburger, 2017
Bark	Used in decoctions for antimicrobial and anti-inflammatory purposes in skin conditions	Akinmoladun et al., 2019
Whole Plant	Exhibits antifungal, antibacterial, antioxidant, and anti-inflammatory activities; used for various dermatologic conditions including acne	Sule et al., 2021; Yakubu et al., 2020

2. METHODOLOGY

This review paper aims to systematically synthesize and evaluate existing scientific literature on the phytochemistry and dermatologic applications of *Senna alata* (L.) Roxb., with a particular focus on its potential efficacy in treating acne. A comprehensive search strategy was employed to identify relevant studies published in peer-reviewed journals, books, and reputable institutional reports.

2.1. Search Strategy and Data Sources

A systematic search was conducted across multiple electronic databases, including PubMed, Scopus, Web of Science, Google Scholar, and ScienceDirect. The search queries utilized a combination of keywords and Medical Subject Headings (MeSH) terms, including but not limited to: "*Senna alata*," "*Cassia alata*," "akapulko," "ringworm bush," "phytochemistry," "pharmacological

activities," "dermatology," "skin infections," "antifungal," "antibacterial," "anti-inflammatory," "antioxidant," "acne," "skin disorders," and "traditional medicine." Boolean operators (AND, OR) were used to combine these terms effectively. References cited in identified articles were also screened for additional relevant publications, a process known as snowballing. The search was not restricted by publication year to ensure a broad historical perspective on the plant's study, though preference was given to more recent and highly cited works where relevant.

2.2. Inclusion and Exclusion Criteria

Studies were included in this review if they met the following criteria

- Focused on *Senna alata* (or its synonyms like *Cassia alata*) as the primary subject.
- Investigated the plant's phytochemical composition.

- Explored any of its pharmacological activities relevant to dermatology (e.g., antifungal, antibacterial, anti-inflammatory, antioxidant).
- Discussed its traditional or documented dermatologic uses.
- Were published in English.

Studies were excluded if they

- Did not primarily focus on *Senna alata*.
- Were review articles (unless used for identifying primary sources)
- Were conference abstracts or unpublished theses without full text availability.
- Focused solely on non-dermatological applications without relevance to the plant's overall phytochemistry or pharmacological profile.

2.3. Data Extraction and Synthesis

From the selected studies, relevant data were extracted and categorized. This included

- Phytochemical Data: Identified compounds, plant parts analyzed, and methods of phytochemical analysis.
- Pharmacological Activity Data: Specific activity (e.g., antifungal, antibacterial), target organisms/models, methodology used (e.g., in vitro, in vivo), and key findings.

- Traditional Use Data: Documented traditional uses, preparation methods, and specific dermatological conditions treated.

The extracted information was then critically analyzed and synthesized to identify recurring themes, key findings, and areas of consensus or disagreement within the literature. This narrative synthesis approach allowed for a comprehensive overview of *Senna alata*'s properties and potential dermatological applications, with particular attention to its relevance for acne treatment. The discussion integrated the phytochemical basis with observed pharmacological effects to provide a holistic understanding of the plant's therapeutic potential.

3. Phytochemistry of *Senna Alata*

The phytochemical profile of *Senna alata* varies significantly across its different morphological parts, which dictates its various traditional and clinical applications. While leaves are the most commonly used part, research shows that roots, bark, and flowers also contain high concentrations of bioactive secondary metabolites. **Distribution by Plant Part.** The concentration of major phytochemicals such as tannins, flavonoids, and saponins is distributed throughout the plant, but their quantitative levels differ by part (Abubakar *et al.*, 2015; Okeke *et al.*, 2021).

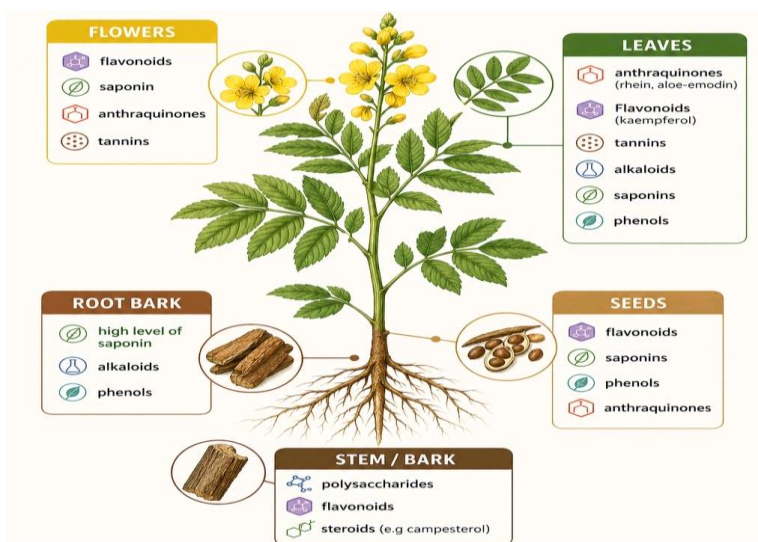


Figure 1. Distribution of Major Phytochemical Compounds in *Senna alata*.

3.1 Leaves (*Folium*)

The leaves are the primary vegetative part used in pharmacology, known for their high concentration of bioactive anthraquinones. They are large, even-pinnately compound leaves (paripinnate) typically reaching 30–60 cm in length. Each leaf consists of 8–14 pairs of large, oblong-elliptical leaflets. The apex is rounded or obtuse, and the texture is described as leathery or chartaceous (Oladeji *et al.*, 2020). Research identifies the leaves as the richest source of rhein and aloë-emodin, which provide the plant its signature antifungal properties (Fatmawati *et al.*, 2020).

3.2 Flowers (*Flos*)

The flowers serve as the most distinct visual identifier and are often used for antimicrobial extractions. These are bright yellow, bisexual flowers arranged in dense, erect terminal racemes. They are initially enclosed in large, orange-yellow bracts that are imbricate (overlapping). The structure is zygomorphic with five unequal petals (Okeke *et al.*, 2021). Studies have isolated specific flavonoid glycosides from the flowers that exhibit significant anti-inflammatory activity (Adedayo *et al.*, 2001).

3.3 Root Bark (*Cortex Radicis*)

The root bark is the protective outer layer of the underground system, often studied for its concentrated alkaloid content. The root bark is the peripheral tissue of the taproot system. It is characterized by a tough, fibrous texture and a brownish-grey external color. Anatomically, it contains secondary phloem and cork cells (Abubakar et al., 2015). Comparative studies show that while it has lower tannin levels than leaves, it contains a significant amount of saponins and alkaloids used in traditional treatments for skin parasites (Abubakar et al., 2015).

3.4 Seeds (*Semen*)

The seeds are the reproductive units of the plant, contained within unique winged pods. Seeds are flattened, somewhat quadrangular or diamond-shaped, and dark brown to black in color. They are housed in a dehiscent, 10–15 cm long pod that features a prominent longitudinal wing on each valve (Oladeji et al., 2020). Seeds contain fatty acids, crude proteins, and specific anthraquinones that contribute to their traditional use as an anthelmintic (worm expeller) (Abubakar et al., 2015).

3.5 Stem and Bark (*Caulis/Cortex*)

The stem and its bark provide the structural framework of the shrub and serve as a transport system for nutrients. The stem is woody at the base and can grow up to 3–4 meters high. The bark is relatively smooth and green to greyish-brown. Microscopic analysis reveals the presence of calcium oxalate crystals in the parenchyma cells, a diagnostic feature of the genus (Savaririrajan et al., 2021). The stem/bark contains high levels of polysaccharides and steroids like campesterol, which are often explored for their potential in treating systemic conditions like malaria (Savaririrajan et al., 2021; Oladeji et al., 2020).

4. Pharmacological Activities of *Senna Alata*

Senna alata exhibits a wide range of pharmacologic activities attributed to its diverse phytochemical constituents, including anthraquinones, flavonoids, tannins, and phenolic compounds. These bioactive components are responsible for its therapeutic potential, particularly in dermatologic applications (Sule et al., 2021; Yakubu et al., 2020).

4.1 Antifungal activity

The antifungal activity of *Senna alata* has been widely documented and is primarily attributed to its anthraquinone constituents, particularly rhein and aloemodin. According to Legaspi and Maramba-Lazarte (2020), *Senna alata* exhibits significant inhibitory effects against fungal pathogens such as *Candida* species, supporting its traditional use in treating skin infections. Similarly, Oladeji et al. (2020) emphasized that these antifungal properties are linked to the plant's rich phytochemical composition, particularly anthraquinones, flavonoids, and phenolic compounds, which contribute to its broad antimicrobial activity.

Furthermore, Chewchinda and Sithisarn (2017) confirmed the presence of key anthraquinones such as rhein and aloemodin in *Senna alata* leaves, which are known to disrupt fungal cell membrane integrity and inhibit fungal growth. In addition, Ajayi et al. (2022) reported that the plant's combined bioactive compounds enhance its effectiveness against various fungal organisms by interfering with cellular processes and promoting antimicrobial action.

4.2 Antibacterial activity

The antibacterial activity of *Senna alata* has been widely reported in scientific literature and is attributed to its diverse phytochemical constituents, including flavonoids, tannins, alkaloids, and anthraquinones. According to Oladeji et al. (2020), extracts of *Senna alata* exhibit inhibitory effects against both Gram-positive and Gram-negative bacteria, indicating its broad-spectrum antibacterial potential. These bioactive compounds act by disrupting bacterial cell walls, denaturing proteins, and interfering with essential metabolic pathways.

Similarly, Ajayi et al. (2022) reported that the plant's phenolic and flavonoid components contribute significantly to its antibacterial effectiveness by inhibiting bacterial growth and preventing microbial proliferation. Supporting this, Legaspi and Maramba-Lazarte (2020) noted that *Senna alata* extracts demonstrated antimicrobial activity that extends beyond fungi to include bacterial species, reinforcing its role as a multifunctional medicinal plant.

4.3 Anti-inflammatory activity

The anti-inflammatory property of *Senna alata* is one of its most significant pharmacological effects, especially in the treatment of skin-related inflammatory conditions. According to Oyedapo et al. (2015), aqueous and ethanolic extracts of *Senna alata* leaves significantly reduced carrageenan-induced paw edema in experimental animals, indicating strong inhibition of acute inflammatory responses. This suggests that the plant interferes with early-stage inflammatory mediators responsible for swelling and pain. Further, Oladele et al. (2013) explained that the anti-inflammatory effect may be associated with the inhibition of cyclooxygenase (COX) enzymes, which are responsible for prostaglandin synthesis. Prostaglandins are key mediators of inflammation, pain, and fever; thus, their suppression results in reduced inflammatory symptoms. In addition, flavonoids such as quercetin and kaempferol, as reported by Akinjogunla and Eghafona (2012), play a major role in suppressing pro-inflammatory cytokines such as TNF- α , IL-1 β , and IL-6. These cytokines are responsible for sustaining chronic inflammation, particularly in skin disorders.

4.4 Antioxidant activity

The antioxidant activity of *Senna alata* plays a crucial role in its overall pharmacological profile, particularly in

reducing oxidative stress linked to inflammation and tissue damage. Adedayo et al. (2014) reported that *Senna alata* leaf extracts contain high levels of phenolic compounds that exhibit strong free radical scavenging activity. These compounds neutralize reactive oxygen species (ROS), which are known to damage cellular structures and worsen inflammatory responses. Flavonoids such as quercetin contribute significantly to this antioxidant activity by donating electrons to unstable free radicals, thereby stabilizing them and preventing oxidative chain reactions. This antioxidant effect is particularly important in dermatological conditions, as oxidative stress is a major contributing factor in skin inflammation, aging, and infection progression.

4.5 Antimicrobial Activity

Antimicrobial activity (broad-spectrum) enabling it to protect the skin from various pathogenic microorganisms and prevent secondary infections (Sule et al., 2021). In addition, its wound-healing properties support tissue regeneration and repair, which are essential in the recovery of damaged skin and acne lesions.

5. SUMMARY

Senna alata (L.) Roxb., known commonly as akapulko or ringworm bush, is a prominent medicinal plant within the Fabaceae family, widely distributed across tropical and subtropical regions. In the Philippines, it is recognized by the Department of Health as one of the ten approved herbal medicinal plants, primarily due to its proven antifungal properties. Traditionally, *S. alata* has been extensively used in ethnomedicine to treat various dermatological conditions, including fungal infections, eczema, itching, and inflammation. Beyond its traditional uses, scientific research has confirmed its broad pharmacological spectrum, encompassing antibacterial, antioxidant, and anti-inflammatory activities.

The phytochemistry of *S. alata* reveals a rich profile of bioactive compounds, including anthraquinones (such as rhein and aloe-emodin), flavonoids (like quercetin and kaempferol), tannins, and phenolic compounds. These compounds are distributed throughout different plant parts, with leaves being a primary source of anthraquinones and flowers containing specific flavonoid glycosides. Each part, from roots and seeds to the bark, contributes unique chemical constituents that underlie its therapeutic applications.

Pharmacologically, *S. alata* exhibits significant antifungal activity, with its anthraquinones disrupting fungal cell membranes and inhibiting growth against various pathogens, including *Candida* species. Its antibacterial properties, attributed to flavonoids, tannins, and alkaloids, demonstrate broad-spectrum efficacy against both Gram-positive and Gram-negative bacteria, including *Propionibacterium acnes*, a key contributor to acne. The plant also possesses potent anti-inflammatory effects, primarily through the inhibition of COX enzymes and suppression of pro-inflammatory cytokines,

making it valuable for inflammatory skin conditions. Furthermore, its antioxidant activity, driven by phenolic compounds, effectively scavenges free radicals, mitigating oxidative stress and supporting overall skin health. These combined activities suggest a strong potential for *S. alata* in treating a range of dermatologic concerns, particularly acne, by addressing its multifactorial.

6. CONCLUSION

In conclusion, *Senna alata* stands as a highly promising natural resource for dermatological applications, particularly in the management of acne and other skin disorders. Its established antifungal, antibacterial, anti-inflammatory, and antioxidant properties are directly linked to its rich and diverse phytochemical composition, including key anthraquinones, flavonoids, and phenolic compounds. The traditional uses of *S. alata* are strongly supported by modern scientific investigations, which elucidate the mechanisms by which these bioactive constituents exert their therapeutic effects. The plant's ability to inhibit microbial growth, reduce inflammation, and combat oxidative stress positions it as a valuable natural alternative or complementary agent in skincare formulations. Further research, particularly clinical trials evaluating its efficacy and safety in human subjects, would be beneficial to fully harness the therapeutic potential of *Senna alata* and integrate it into mainstream dermatological practice.

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