



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Article

A Review of Anti-microbial Bio-defenders

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ARTICLE INFO

Received: 19 June 2024

Accepted: 28 June 2024

Published: 12 July 2024

Keywords:

Anti-fungal Activity, Anti-microbial, Okra

(*Abelmoschus esculentus*),

Shikakai (*Acacia concinna*),

Amla (*Phyllanthus emblica*),

Candida albicans, Bio-defenders, Defensin-1.

DOI:

10.5281/zenodo.12732442

ABSTRACT

Microbial infections pose significant health challenges worldwide, necessitating effective treatment strategies. Traditional medicinal practices have long relied on natural bio-defenders to combat such infections. This review explores the therapeutic potential of bio-defenders such as Honey, Okra, Shikakai, Amla, Turmeric, and Aloe Vera in the management of microbial infections.

INTRODUCTION

Introducing microbial bio defenders, a formidable arsenal of nature's gifts that fortify our health defenses against microbial threats both internally and externally. Honey, Amla, Shikakai, and Okra are distinguished bio-active substances with substantial antimicrobial properties, proving effective for both internal consumption and topical use. Honey, revered for its antimicrobial properties, offers not only sweetness but also wound healing and sore throat relief. Okra, rich in flavonoids and polyphenols, serves as a potent

combatant against harmful bacteria and fungi, enhancing our microbial balance. Shikakai, known for its saponins, cleanses the scalp while actively preventing microbial infections. Amla, abundant in vitamin C and antioxidants, bolsters our immune system and combats microbial invaders. Aloe Vera, with its aloin and aloe-emo-din compounds, offers a versatile shield against bacteria, viruses, and fungi, promoting healing and overall wellness. Turmeric, derived from the *Curcuma longa* plant, is celebrated for its multifaceted health benefits, particularly its potent

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



antimicrobial properties. Rich in curcumin, its active compound, turmeric has been extensively studied for its ability to combat various pathogens, including bacteria, viruses, and fungi. These microbial bio defenders, when incorporated into our routines, support a holistic approach to health, safeguarding us against microbial challenges from within and without. Antimicrobial agents have been employed for centuries to treat microbial infections, often without the adverse effects associated with conventional medications.

Anti-Microbial Agents

Honey

Honey exhibits exceptional antimicrobial properties due to its chemical composition, including high sugar content, low pH, and bio-active compounds like hydrogen peroxide, methylglyoxal, and defensin-1. These factors create a hostile environment for microbial growth by dehydrating cells, inhibiting proliferation, and providing antiseptic actions. Medicinally, honey is highly effective in wound healing, promoting a moist environment, reducing inflammation, and stimulating tissue regeneration. It is particularly beneficial for treating burns, ulcers, and surgical wounds, and is effective against antibiotic-resistant bacteria such as MRSA. Honey also possesses anti-fungal properties, inhibiting the growth of fungi like *Candida* species, and is useful for managing skin and mucous membrane infections. Additionally, its anti-inflammatory and antimicrobial effects help soothe sore throats, suppress coughs, and support respiratory health.

Okra

Okra, scientifically known as *Abelmoschus esculentus*, boasts significant antimicrobial abilities due to its diverse chemical makeup. Its constituents, including flavonoids, polyphenols, and mucilage, work together to impede the growth of microbes. Flavonoids and polyphenols not only act as antioxidants but also disrupt microbial cell walls, while mucilage aids in trapping and

neutralizing pathogens. Medically, okra is esteemed for its capacity to heal wounds by reducing inflammation and fostering tissue regeneration. Its antimicrobial properties further fortify this process by preventing infections in wounds, thereby expediting recovery. Moreover, okra demonstrates effectiveness against fungal infections like *Candida* species, owing to its anti-fungal properties. Its anti-inflammatory attributes contribute to alleviating symptoms and fostering healing across various conditions. In essence, okra's antimicrobial prowess, bolstered by its flavonoids, polyphenols, and mucilage, positions it as a potent natural remedy for combating bacterial and fungal infections, promoting wound healing, and mitigating inflammation.

Amla

Phyllanthus emblica, commonly referred to as Amla, is a tree indigenous to India and Southeast Asia. It yields fruits abundant in bio-active compounds, prompting a growing curiosity in naturally derived substances with biological properties. Amla, also known as Indian gooseberry, is often reputed for its high ascorbic acid (vitamin C) content, purportedly reaching up to 445 mg per 100 grams. However, the specific vitamin C content is disputed, and the fruit's overall bitterness is likely due to its high density of ellagitannins. These include emblicanin A (37%), emblicanin B (33%), punigluconin (12%), and pedunculagin (14%). Additionally, Amla contains punicafolin, phyllanemblinin A, and other polyphenols such as flavonoids, kaempferol, ellagic acid, and gallic acid. The phytochemicals present in Amla exhibit a diverse array of properties, including anti-oxidant, anti-inflammatory, hepatoprotective, cardioprotective, immunomodulatory, hypolipidemic, memory-enhancing, anticancer, antidiabetic, antidepressant, anti-ulcerogenic, insecticidal, larvicidal, and wound-healing effects.

Shikakai



The ancient Ayurvedic herb Shikakai is derived from the *Acacia concinna* plant and is well-known for its antibacterial and hair-care effects. There exist many pathways that are responsible for the antibacterial effects of Shikakai. Cell lysis and enhanced permeability are the results of saponins' disruption of microbial cell membranes. Tannins denature microbial proteins by attaching to and inactivating vital enzymes, hence preventing their development and function. Further impeding growth and replication are phenolic chemicals and flavonoids, which block microbial enzymes essential for their metabolic activities. Furthermore, microbial cells undergo oxidative stress due to the antioxidant qualities of flavonoids and phenolic compounds, which damages the cells' lipids, proteins, and DNA and ultimately results in cell death. In hair and skin care, Shikakai's saponins act as effective cleansers, removing dirt, oil, and microbes without stripping the hair of its natural oils. Its antimicrobial properties help combat scalp infections, such as dandruff, which can be caused by fungal organisms like *Malassezia*. Moreover, the anti-inflammatory properties of Shikakai soothe the scalp, reducing itching and irritation often associated with microbial infections. Overall, Shikakai's rich chemical composition and diverse bioactive compounds make it a potent natural remedy for maintaining scalp health and combating microbial infections. Its saponins, tannins, flavonoids, phenolic compounds, and glycosides work synergistically to disrupt microbial cells, inhibit their enzymes, and induce oxidative stress, offering a multifaceted approach to hair and scalp care.

Turmeric

The family Zingiberaceae, which includes turmeric (*Curcuma longa* L. syn *C. domestica* Val.), is widely grown for its rhizomes. This perennial plant grows throughout the world's tropical and subtropical climates, including

Bangladesh, India, Pakistan, and Sri Lanka. Turmeric rhizomes include curcumin, desmethoxycurcumin, and bisdemethoxycurcumin, which together are referred to as curcuminoids (3-6%). The rhizome of turmeric also contains 1-hydroxy-1, 7-bis (4-hydroxy-3-methoxyphenyl) -(6E)-6-heptene-3, and other phenolic chemicals. There have been several reports of turmeric's pharmacological properties. One of its main ingredients, curcumin, is what gives it its many biological effects. While it has demonstrated antiparasitic and anti-inflammatory action, it also demonstrates anti-parasitic, antispasmodic, anti-inflammatory, anti-carcinogenic, and gastrointestinal properties *in vitro*.

Aloe

For millennia, people have utilized and appreciated the health, aesthetic, therapeutic, and skin-care benefits of aloe vera plants. The Arabic word "Alloeh," which means "shining bitter substance," is the source of the name Aloe vera. The Latin word "vera" means "true." Aloe *barbadensis* miller is the scientific name for Aloe. It is a perennial, xerophytic, succulent, shrubby or arborescent plant with pea-green hue that is a member of the Asphodelaceae (Liliaceae) family. It is mostly found growing in arid parts of America, Europe, Asia, and Africa. It may be found in Tamil Nadu, Maharashtra, Gujarat, Rajasthan, and Andhra Pradesh, India. Vitamins, enzymes, minerals, carbohydrates, lignin, saponins, salicylic acids, and amino acids are among the 75 potentially active ingredients found in aloe vera. ### Aloe Vera: Chemical Constituents and Antifungal Properties The primary chemical constituents of Aloe vera include anthraquinones, catechin, vanillic acid, catechol, and aloesin. Renowned for its applications in health, beauty, and skincare, Aloe vera exhibits notable antifungal properties attributed to secondary metabolites such as



anthraquinones, saponins, and tannins. Hydroalcoholic extracts of Aloe vera leaves have demonstrated antifungal activity, effectively inhibiting the mycelial growth of pathogens such as *Botrytis gladiatorum* and *Fusarium oxysporum*. Clinically, Aloe is primarily utilized for treating fungal infections, reducing acne and dental plaque, and hydrating and moisturizing the skin.

DISCUSSION AND CONCLUSION

Bio-defenders, including okra, honey, Shikakai, aloe vera, turmeric, and Amla, are potent natural antimicrobial agents sourced from plants and organic materials. They serve as promising avenues for both preventing and treating infections. Regular consumption of these bio-defenders strengthens the body's immune defenses, maintaining microbial balance and reducing infection risk. In cases of infection, their broad-spectrum antimicrobial properties provide effective treatment options, complementing conventional therapies. Additionally, their anti-inflammatory and antioxidant effects contribute to the healing process. Available in various forms, from dietary supplements to skincare products, bio-defenders offer a natural and adaptable approach to promoting overall health and well-being. Incorporating them into daily routines can enhance immune function and reduce the likelihood of infections. These natural products offer effective, alternative solutions to synthetic antimicrobials, with the added benefits of being generally safe, readily available, and possessing additional therapeutic properties. Future research should focus on further elucidating their mechanisms of action, optimizing their formulations, and evaluating their efficacy in clinical settings to harness their full potential as antimicrobial bio-defenders.

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HOW TO CITE: Praveena M. V.*, Liyana Baiju, Midhilaraj B. K, A Review of Anti-microbial Bio-defenders, *Int. J. of Pharm. Sci.*, 2024, Vol 2, Issue 7, 737-741. <https://doi.org/10.5281/zenodo.12732442>

