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REVIEW ON ANTIMICROBIAL ACTIVITY OF LEMON GRASS (CYMBOPOGAN CITRATUS)

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ABSTRACT

Lemongrass (Cymbopogon citratus) is a widely used aromatic herb known for its diverse applications in culinary, medicinal, and cosmetic fields. This review focuses on its antimicrobial properties, particularly its antibacterial and antifungal activities. The essential oil extracted from lemongrass, primarily composed of compounds such as citral, geraniol, and limonene, has demonstrated significant efficacy against a range of pathogenic microorganisms, including Gram-positive and Gram-negative bacteria, as well as various fungal strains. Mechanisms of action include disruption of microbial cell membranes, inhibition of enzymatic activity, and prevention of biofilm formation. Research highlights the potential of lemongrass as a natural preservative in food systems and as a candidate for alternative therapeutic agents in the face of rising antimicrobial resistance. Given its broad-spectrum activity and low toxicity, lemongrass emerges as a promising natural antimicrobial agent, warranting further investigation into its applications and mechanisms of action.

Keywords: Antimicrobial activity, lemon grass

1. INTRODUCTION

Nature is the source of the medicinal agents for the 1000 of years. Most of the plants are the medicinal plants in the all over the world [1]. *Cymbopogon citratus* (DS.) stapf, commonly called as lemon grass and it is a *Cymbopogan* speices. It is a coarse grass with a strong lemon taste. It is cultivated in the tropical and subtropical areas and it's cultivated by the purpose of the medicinal uses in the through out the world. The medicine values use of lemon grass is cough, consumption, elephantiasis, malaria, ophthalmia, pneumonia and vascular diseases [2]. Most of the medicinal plants produced as phytochemical constituents that means the secondary metabolites. Namely, Alkaloids, Tannins, Saponins, Flavonoids, Antraquinones, Glycosides, Volatile oils, Terpenes, Essential oils, Resins [3]. Lemon grass oil consist of the citral as well as the geraniol and geranyl acetate are present in little amounts in oils of *Cymbopogon* spp. Citral is an isomeric mixture of geranial (citral A) and neral (citral B) [4]. Citral is the used to production of ionones and vitamin A [5]. There are many different chemical compounds used as an antimicrobial activity. The Lemon grass oil is also act as the antifungal, antiyeast, insecticidal, antiparastic, antiviral and the antiprotozoan activities [6-7]. And also used as in pharamaceutical industries, cosmetics, foods, flavours and agricultural industries. There are some chemicals used as a plant disease control. These chemicals are Benzimidazoles, aromatic hydrocarbons and sterol biosynthesis inhibitors. Researchers observed the gram-positive organisms more sensitive than the gram-negative organisms [8]. The lemongrass oil was effective against *Acinetobacter baumanii (A. baumanii), Aeromonas veronii (A. veronii), Enterococcus faecalis (E. faecalis), Escherichia coli (E. coli), Klebsiella pneumonia (K. pneumonia), Salmonella enterica (S. enterica) serotype typhimurium, Serratia marcesens (S. marcesens), Proteus vulgaris (P. vulgaris), Enterobacter aerogenes (E. aerogenes), Corynebacterium equii (C. equii)* and *Staphylococcus aureus (S. aureus)* [9-11].

2. TAXONOMIC DETAILS OF THE LEMONGRASS

Kingdom:	**Plantae**
Division:	**Magnoliophyta**
Class:	**Liliopsida**
Order:	**Poales**
Family:	**Poaceae**
Genus:	***Cymbopogon***
Species:	***C. citratus***

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Figure1: Cymbopogan citratus (Lemon Grass)

3. ANTIMICROBIAL ACTIVITY

Lemongrass (Cymbopogon citratus) exhibits notable antimicrobial activity due to its rich composition of essential oils, primarily citral, which has been shown to inhibit the growth of various bacteria, fungi, and viruses. Studies indicate that lemongrass oil can be effective against pathogens such as Staphylococcus aureus, Escherichia coli, and Candida species.The antimicrobial effects are attributed to mechanisms such as disruption of microbial cell membranes, interference with metabolic processes, and modulation of enzyme activities. Additionally, lemongrass has been used in traditional medicine for its potential health benefits, including its role as a natural preservative in food products.

3.1 Antifungal Activity:

Lemongrass (Cymbopogon citratus) has garnered attention for its antifungal properties, primarily attributed to its essential oil, which contains compounds like citral, geraniol, and limonene. Research has shown that lemongrass oil can effectively inhibit the growth of various fungal pathogens, including *Candida* species, *Aspergillus*, and *Trichophyton*.

Mechanisms of Action

1. *Cell Membrane Disruption*: The essential oils can penetrate fungal cell membranes, leading to increased permeability and ultimately cell death.

2. *Inhibition of Biofilm Formation*: Lemongrass has shown potential in preventing biofilm formation, which is crucial for the pathogenicity of many fungi.

3. *Metabolic Interference*: Active compounds may disrupt metabolic pathways essential for fungal growth and reproduction.

Efficacy Against Specific Fungi

- *Candida albicans*: Studies have demonstrated significant inhibitory effects on growth and biofilm formation.

- *Aspergillus species*: Lemongrass oil exhibits antifungal activity, particularly against A. flavus and A. niger, which are known for their role in food spoilage and mycotoxin production.

- *Trichophyton*: Some research indicates effectiveness against dermatophytes responsible for skin infections [12].

3.2 Antibacterial Activity:

Lemongrass (Cymbopogon citratus) is recognized for its antibacterial properties, primarily due to its essential oils, which contain active compounds such as citral, geraniol, and limonene. These compounds have been the focus of various studies investigating lemongrass's effectiveness against a range of bacterial pathogens.

Mechanisms of Action

1. *Cell Membrane Disruption*: The essential oils can penetrate bacterial membranes, leading to increased permeability and cell lysis.

2. *Inhibition of Enzymatic Activity*: Compounds in lemongrass may inhibit key enzymes involved in bacterial metabolism and growth.

3. *Biofilm Disruption*: Lemongrass has shown potential in preventing or disrupting biofilm formation, which is crucial for bacterial survival and resistance.

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Efficacy against Specific Bacteria

- *Gram-positive Bacteria*: Lemongrass has demonstrated strong activity against pathogens like Staphylococcus aureus and Streptococcus species, which are significant in both clinical and food safety contexts.

- *Gram-negative Bacteria*: It has also been effective against *Escherichia coli, Salmonella typhimurium, and Pseudomonas aeruginosa,* highlighting its broad-spectrum potential.

- *Food borne Pathogens*: The antibacterial properties of lemongrass are particularly relevant in food preservation, helping to inhibit pathogens that cause spoilage and food borne illness [13].

Applications

1. Food Preservation: Due to its antibacterial activity, lemongrass oil can be used as a natural preservative in food products.

2. Pharmaceuticals: Its antibacterial properties make it a candidate for developing alternative treatments, especially in the face of increasing antibiotic resistance.

3. Cosmetics and Personal Care: Lemongrass oil is also utilized in products for its antimicrobial effects, contributing to skin care formulations.

4. CONCLUSION

The antimicrobial activity of lemongrass presents a promising avenue for both industrial and therapeutic applications. Ongoing research is needed to explore its mechanisms, effective concentrations, and potential synergistic effects with other natural antimicrobial agents. Its natural origin and effectiveness against resistant strains make it an appealing alternative in the search for new antibacterial and antifungal solutions.

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