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Antimicrobial Activity of *Cymbopogon* (Lemongrass) on Enterococci

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: The aim of this study was to investigate antimicrobial activity against Enterococcus bacteria.
Materials and Methods: Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were determined by the Broth Dilution Method. The antibiotic susceptibility test against the test organisms was performed by the Disc Diffusion Method.
Results and Discussion: Antimicrobial activity of *Cymbopogon* oil was examined against common Enterococcus bacteria using broth microdilution assay and the disc diffusion method. Zone of inhibition was seen when *Cymbopogon* oil was kept with enterococcus bacteria, this proves to be bacteriostatic.
Conclusion: Lemongrass oil proved to be bacteriostatic against Enterococcus, further research to be done to implement Lemongrass oil as an antibacterial agent.

Keywords: Lemongrass oil; Enterococci; antimicrobial.

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1. INTRODUCTION

There are roughly 55 unique sorts of lemongrass species—an enduring grass that flourishes in heat and humidities. Two of the species utilized in oils are *Cymbopogon citratus* (West Indian grass) and *Cymbopogon flexuosus* (East Indian grass). *Cymbopogon flexuosus* is the sort utilized in Cliganic's lemongrass oil. Lemongrass oil is removed through steam refining from the new and half dried lemongrass leaves and stems. The fragrance of lemongrass oil is amazingly solid—a smidgen goes far. It can rapidly overwhelm different oils if not utilized in the perfect sums. The aroma is depicted as new, lemony, verdant, earthy and sweet. The vast majority discover the smell alluring. (Honey bees additionally think that it's appealing on the grounds that the oil impersonates the pheromone created by bumble bees. Utilizing lemongrass oil can urge honey bee settlements to move into a specific spot.

In vitro and in vivo considerations have indicated that lemongrass EO and its volatiles can repress a scope of microbes and growths known to be the major causative creatures for a few stockpiling and food-borne microorganisms [1,2]. Lemongrass EO has been accounted for to impede waste of pastry shop items, cheddar, natural products, and chocolates, among others [3,4]. The oil has likewise been demonstrated to be a successful fumigant for putting away food spoilage because of its bioactivity in the fume stage [5]. Lemongrass EO was found to essentially decrease settlement improvement against key postharvest microorganisms: Colletotrichum coccodes, Botrytis cinerea, Cladosporium herbarum, Rhizopus stolonifer, and Aspergillus niger in vitro [6]. The oil was found to increase the shelf life of realistic usability and tactile properties of refrigerated mussels and vegetables [7]. Reports propose that lemongrass oil is a protected common flavor perplexing, additive, and food deterioration inhibitor fit for decreasing the danger of sicknesses related with tainted items [8].

Citratus is generally utilized in medication for treatment of apprehensive and gastrointestinal disturbances, and as antispasmodic, pain relieving, calming, antipyretic, diuretic and narcotic. Studies on concentrates from Citratus leaves have shown oxidant, hostile to microbial and hostile to contagious exercises.

The development of bacterial resistance to most of the presently available antibiotics has necessitated the search for new and efficient antibacterial agents. Our team has extensive knowledge and research experience that has translate into high quality publications [9–20,21–25,26–30]. Hence the present study was carried out to find out the antibacterial activity of lemongrass oil against Enterococcus bacteria. The aim of this study was to investigate antimicrobial activity against Enterococcus bacteria.

2. MATERIALS AND METHODS

Study setting: Biomedical and Environmental Health Research Lab - microbiology Lab, Saveetha dental College.

2.1 Procurement of Lemongrass Oil

The essential oil of lemongrass (*Cymbopogon citratus*) was collected from a local medical shop in Chennai, India.

2.2 Test Organisms/Bacterial Organisms

The test organisms used in this study were obtained from the Culture Collections of the Department of Microbiology and Microbial Technology, Saveetha institute of medical and technical sciences-Deemed University. The organism used in this study was Enterococcus.

2.3 Propagation and Maintenance of Test Organisms

The test organisms were streaked on the Nutrient Agar slants and were incubated overnight at (37 +1)ºC. The cultures were kept under refrigerated conditions and were subcultured after every day [31].

2.4 Preparation of Concentrations of Lemongrass Oil

The different concentrations (v/v) of lemongrass oil viz 5%,10%, 15%, 20% were prepared aseptically in sterile conditions [32].

2.5 Antibacterial Activity

The testing of the bacterial cultures for the inhibitory effect of essential oil of lemon grass for different concentrations using saline as the solvent (5 %, 10 %, 15%, 20%) were performed by using disc diffusion method as described by Southwell et al. [33]. No control study was

required as we were only comparing antibacterial activity of lemongrass in different concentrations. 1μL of active cell suspension of organisms was spread with the help of sterilized long swabs on the agar surface uniformly. The measured quantity of 5-20μ L of each concentration was pipetted out with a sterilized pipette and the discs were soaked with various concentrations of LG oil and then placed on the agar plate. The plates were incubated at (37+1)ºC for 24-48 hours. The zone of inhibition (mm) was measured with a measured scale after the period of incubation.

3. RESULTS

The result of the present study was given in Table 1 which depicts the zone of inhibition for different concentrations for the clinical isolated species of enterococci.

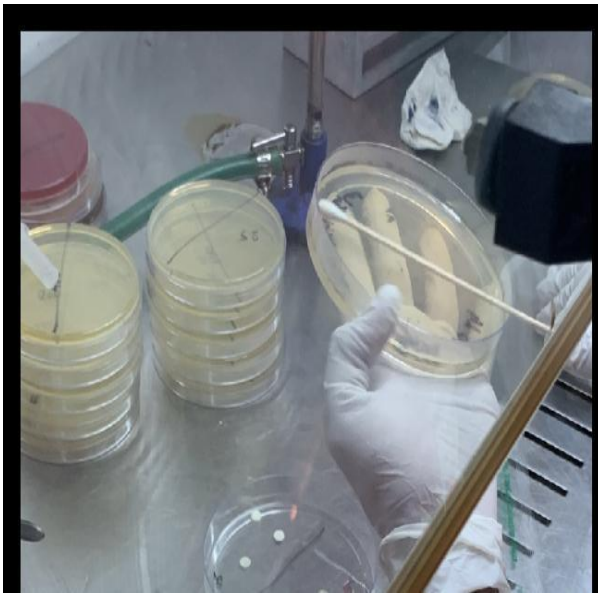

Fig. 1

Fig. 2

Fig. 1. Coating of the nutrient agar plate with enterococcus bacteria
Fig. 2. Placing the disc containing lemongrass oil

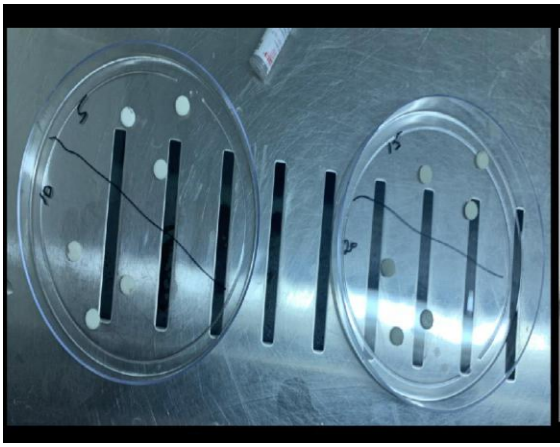

Fig. 3.

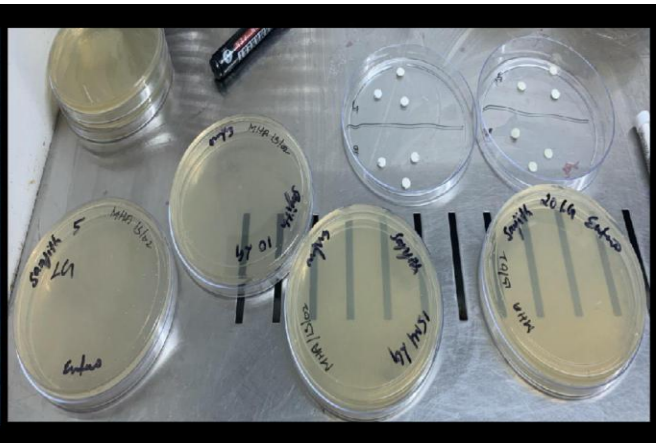

Fig. 4.

Fig. 3. Represents the partition made according to the different concentrations of lemon grass oil
Fig. 4. Represents the plates kept inside the incubator for 24 hours

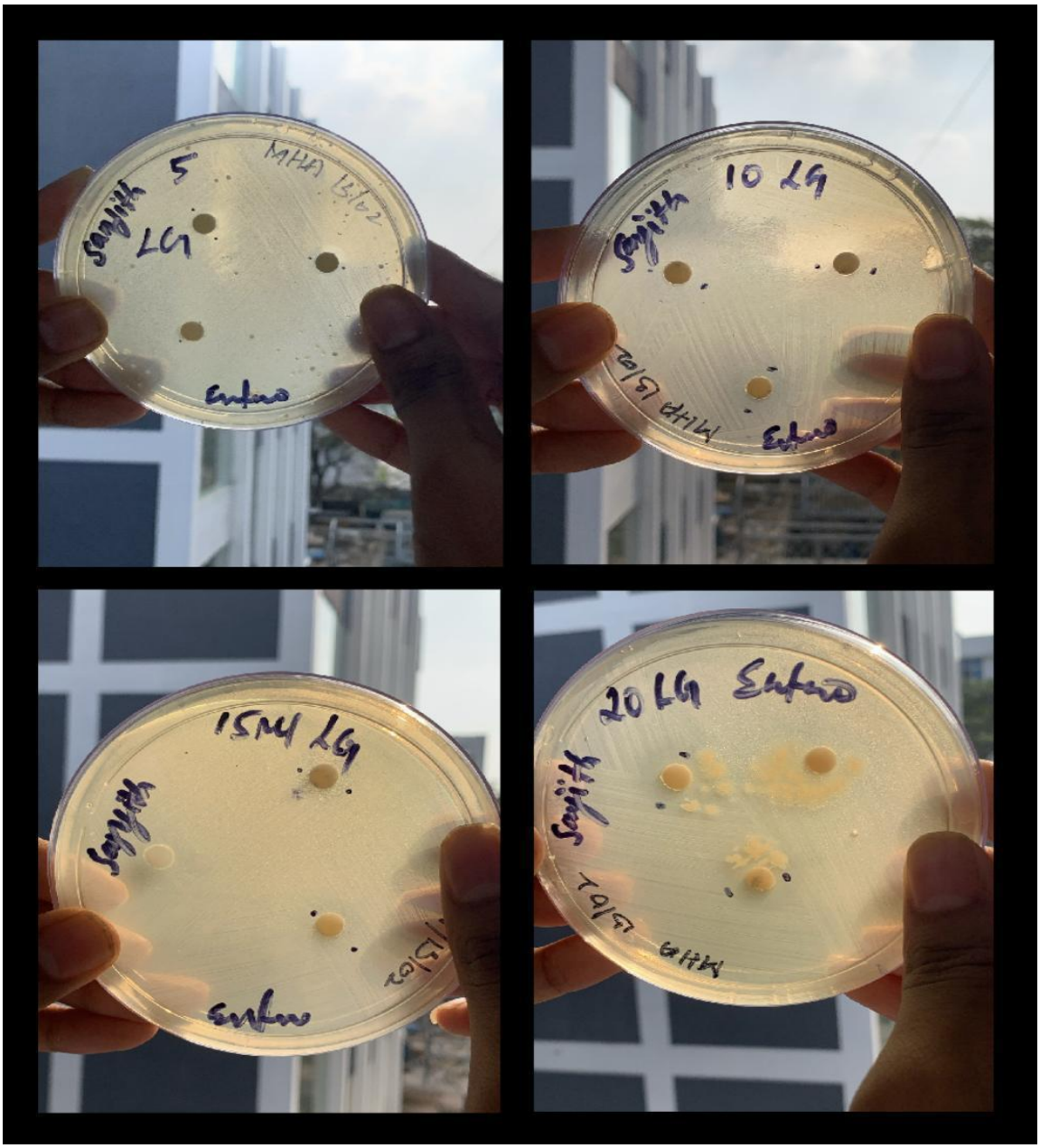

Fig. 5.

Fig. 5. Represents the different zones of inhibitions for different concentrations of lemongrass oil

Table 1. Representing the different zones of inhibition for different concentrations of lemongrass oil added

Concentration	DISC 1	DISC 2	DISC 3	Mean Value
5 micro L	11 mm	10 mm	8 mm	9.6 mm
10 micro L	13 mm	13.5 mm	15 mm	13.8 mm
15 micro L	15 mm	14 mm	14 mm	14.3 mm
20 micro L	15 mm	14.5 mm	14 mm	14.5 mm

4. DISCUSSION

The antibacterial activity was found progressively increasing with the increase in concentration of oil. The maximum effect was found at 20% concentration and minimum effect was observed at 5% concentration of oil (Table 1). In the Broth Dilution Method the test organisms were found to be inhibited by lemongrass oil at very low concentration [34].

After incubating for 24 hours, zones of inhibitions were calculated for each concentration. For 5μL of lemongrass oil concentration, 9.6 mm of zone of inhibition was present, For 10μL of lemongrass oil concentration, 13.8 mm of zone of inhibition was present, For 15μL of lemongrass oil concentration, 14.3 mm of zone of inhibition was present, similarly for 20μL of lemongrass oil concentration, 14.5 mm of zone of inhibition was seen (Table 1).

Limitations of the study are: Less number of sample size, Homogeneous population, Restriction of sample to specific species of the organism. Our discoveries may, notwithstanding, be summed up to comparative gatherings, with a great view of alternatives to regular medicines. Future research on lemongrass oil can be done on a wide basis to know the exact components present which are responsible for the antimicrobial activity.

Thus, we conclude that in the present era of emerging multidrug resistance among gram positive and gram negative organisms, lemongrass oil will be helpful in treating such infections.

5. CONCLUSION

Thus, we conclude that Lemongrass oil proved to be bacteriostatic against Enterococcus, further research to be done to implement Lemongrass oil as an antibacterial agent, lemongrass oil will be helpful in treating infections in the present era of emerging multidrug resistance among gram positive and gram negative organisms.

CONSENT

It is not applicable.

ETHICAL AAPPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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