

Research Article

Evaluation of Antimicrobial Efficacy of Essential Oils on Streptococcus Mutans

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ABSTRACT

Dental caries is a major health problem worldwide. The mouth is colonized by many types of bacteria, but only a few participate in dental caries formation. *Streptococcus mutans*, a facultative gram positive anaerobe is commonly found in oral cavity. It is the primary causative agent of dental caries. Several chemical agents are available for treatment of caries, but they have side effects and tooth staining. Treatment of caries with natural products is considered as a safer option nowadays as they have lesser side effects and better prognosis. Essential oils are rich sources of biologically active compounds. They have been used for a wide variety of purposes for many thousands of years. The aim of the present study is to evaluate the antibacterial activity of two essential oils lemon grass and thyme on *Streptococcus mutans*. Antibacterial activity of the two essential oils, Lemon grass and Thyme were screened against *Streptococcus mutans*, using disc diffusion technique. The results of this study showed that the oils at different concentrations exhibited anti-bacterial activity against *Streptococcus mutans*.

Keywords: Anti-bacterial, dental caries, essential oils, disc diffusion technique

INTRODUCTION

Dental caries is a major health problem worldwide. It is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of the calcified tissues¹. Dental caries can be due to four factors: host, microflora, substrate and the time². The likelihood of dental caries development is higher when microbial load is high due to excessive plaque. The bacteria can survive in acidic conditions. The mouth is colonized by many types of bacteria, but only a few participate in dental caries formation. *Streptococcus mutans*, a facultative gram positive anaerobe is commonly found in oral cavity. It is the primary causative agent of dental caries³. *S. mutans* can strongly adhere to the tooth surface, produce acidic metabolites and they have the capacity to build up glycogen reserves^{4,5}. Diet containing sucrose is the main reason for high acid production and so dental caries⁶. The bacteria produce acidic by products when they metabolize sugar, so the pH becomes low which helps the bacteria to survive. As the dental caries has different etiology for its formation and development, it has been difficult to prevent caries. Treatment is associated with pain experienced by many patients. It involves drilling which has thermal effects and causes damage to the pulp². Several chemical agents are available for treatment of caries, but they have side effects such as vomiting, diarrhoea and tooth staining^{7,8}. Treatment of caries with natural products is considered as a safer option nowadays as they have lesser side effects and better prognosis.

Essential oils are rich sources of biologically active compounds. They have been used for a wide variety of purposes for many thousands of years⁹. These oils possess antibacterial, antifungal, antiviral, insecticidal and

antioxidant properties against microorganisms¹⁰. The mechanism by which the essential oils exert their antimicrobial properties is poorly understood but the main target appears to be the cell membrane of the bacterial cells^{11,12}. Because of this the gram negative microbes are in general more resistant to the antimicrobial activity of the essential oils due to the presence of the outer membrane¹³. This article includes the use of two essential oils- Lemon grass oil and Thyme oil for using against *Streptococcus mutans*.

Lemon grass has the scientific name *Cymbopogon citratus* belongs to Poaceae family which are distributed in tropical and subtropical world^{14,15}. The main components of lemon grass oil are myrcene, cironellal, geranyl acetate, nerol. It is used as an antispasmodic, analgesic, antibacterial, antipyretic, diuretic and sedative¹⁶. Lemon grass oil has the ability to control bacterial growth and fungal pollutant in food also the antioxidant activity of the oil is proven¹⁷.

Thyme oil is derived from Thyme which is scientifically known as *Thymus vulgaris*. It is a perennial herb which belongs to mint family. The oil contains 20-54% thymol. It also contains p-cymene, myrcene, borneol, carvacrol and linolool. Thyme has high antimicrobial effect various organism¹⁰. It has pharmacological properties such as spasmolytic, antiseptic, antitussive, expectorant¹⁸. Its efficacy has been attributed mainly to thymol and carvacrol¹⁹.

MATERIALS AND METHODS

Test Microorganisms

Bacterial strain used was *Streptococcus mutans*. The organism was isolated using selective media. Mutans-



Sanguis agar [Hi media M977], and maintained in nutrient agar slope at 4°C in department of Microbiology, Saveetha Dental College.

Methodology

The essential oils, thyme and lemon grass were loaded on sterile filter paper discs measuring 6mm diameter in the following concentrations 50 μ l, 100 μ l respectively. The discs were dried and kept aseptically.

Screening of Antibacterial Activity [Disc Diffusion Technique]

Broth culture of the bacterial strain compared to Mac Farland's standard⁴⁻⁶ 0.5 was prepared. Lawn culture of the test organisms were made on the Muller Hinton agar [MHA-Hi media M1084] plates using sterile cotton swab and the plates were dried for 15 minutes. Filter paper discs loaded with different concentrations of the essential oils were placed on the respective plates. The plates were incubated at 37°C overnight and the zone of inhibition of growth was measured in millimeters. All the tests were

done in triplicate to minimize the test error.

RESULTS AND DISCUSSION

The antibacterial activity of the essential oils at different concentrations was screened by disc diffusion technique and the zone of inhibition was measured in mm diameter. The results are given in the Table 1. The Thyme oil was more effective against Streptococcus mutans with a zone of inhibition of 28mm diameter (at conc200 μ l.), Lemon grass oil showed a zone of 23mm diameter. The elimination of cariogenic bacteria from the oral cavity using antibacterial agents is one of primary strategies for prevention of dental caries. Herbs are being widely explored to discover alternatives to synthetic antibacterial agents. Essential oils have been shown to possess antibacterial, antiviral, insecticidal and antioxidant properties. The present study was to evaluate the antibacterial activity of thyme and lemon grass oil on caries causing bacteria. The results obtained from our study shows that the two essential oils have got a very good antibacterial activity against Streptococcus mutans.

Table 1: Anti-bacterial activity of Thyme and lemon grass oil on Streptococcus mutans

Organism	Conc μ l	E1 [Zone of inhibition in mm diameter]	E2 [Zone of inhibition in mm diameter]	Chlorhexidine [Zone of inhibition in mm diameter]
Streptococcus mutans	50	18	12	22
	100	21	17	30
	200	28	23	38

E 1 – Thyme oil, E 2 – Lemon grass oil

CONCLUSION

Down the ages essential oils and other extracts of plants have evoked interest as sources of natural products. Essential oils have been shown to possess antibacterial, antifungal, antiviral insecticidal and antioxidant properties.

From this study it can be concluded that both the essential oils thyme and lemon grass, possess antibacterial activity. It can be used as antibacterial supplement in the developing countries towards the development of new therapeutic agents.

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