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Research Article

ANTI-BACTERIAL ACTIVITY OF CLOVE OIL AGAINST STAPHYLOCOCCUS AUREUS

Lakshya Rani[1] and Gopinath P[2]*

Department of Microbiology Saveetha Dental College, Chennai

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ABSTRACT

Staphylococcus aureus has been well-documented as a human as well as animal pathogen. Cloves have been used by humans for medicinal applications for over 2000 years. Itis widely used for relieving toothache or cavity problems and in aromatherapy and as an antiseptic in oral infections. Our study was indented to determine the antibacterial activity of clove oil against Staphylococcus aureus. The MIC of clove oil was appeared to be 0.125% for S. aureus. The clove oil was found to have antibacterial activity against S. aureus. However, its irritant properties has been evaluated before it is formulated for medicinal purpose.

INTRODUCTION

Staphylococcus aureus has been well-documented as a human as well as animal pathogen. This organism is implicated in different infectious conditions such as furuncles or boils, cellulitis, impetigo, and postoperative wound infections of various sites. It has also been associated with serious and life-threatening infections such as bacteremia, pneumonia, osteomylitis, acute endocarditis, myocarditis, pericarditis, cerebritis, and meningitis[13]. Moreover, it is connected with toxin-related diseases. These isolates were found to be resistant to most of the available antibiotics due to intrinsic and extrinsic mechanisms[12].

Essential oils are chemically terpenes that are one of the largest group of plant secondary metabolites. They are volatile, limpid, coloured and are soluble in lipids and organic solvents that have a lower density than water. They may be present in all plant organs of specific plant families, including buds, flowers, leaves, seeds, twigs, stems, flowers, fruits, roots, wood or bark and are generally stored by the plant in secretory cells, cavities, canals, glandular trichomes or epidermal cells. Essential oils of many medicinal plants have been used for evaluation of their antibacterial and anti-fungal activities [1,2] . Studies have shown that essential oils contain a wide series of compounds that can inhibit or slow the growth of bacteria, yeasts and moulds inhibiting their transmission. Essential oils have been widely used in dentistry as an antiseptic and local anesthetic [10]. Clove oil and eucalyptus oils are two very familiar names in this category of essentials. Essential oils are potential sources of novel antibacterial compounds especially against bacterial pathogens[1]. The antibacterial property of essential oils from plants was used empirically for centuries, but only recently has it been studied scientifically. An increasingly body of research is being compiled on the antibacterial activity of various plant oil extracts and their specific components for possible application in fields ranking from food industry to dentistry [3,4]. Clove oil is extracted from Syzygium aromaticum of the Myrtaceae family. They are dried, the unopened inflorescence of about 1/2-3/4 inch in length. They contain 14-20% essential oil. Cloves are strongly pungent due to their high content of eugenol, which can be extracted by distillation to yield the essential oil [5,6] Cloves have been used by humans for medicinal applications for over 2000 years. It is widely used for relieving toothache or cavity problems and in aromatherapy and as an antiseptic in oral infections. The health benefits of clove oil can be attributed to its antimicrobial, antifungal, antiseptic, antiviral, aphrodisiac and stimulating properties. The antimicrobial activity of the clove oil contributes in many application such as pharmaceutical, medicine and food preservative[11].

It is a natural antibiotic[7] with broad antimicrobial activities against Gram-positive, Gram-negative, and acid-fast bacteria, as well as fungi [7,8].It has been used as a histological clearing agent[3,4]. The intake of the oil provides carminative and anti-

*Corresponding author: **Gopinath P**
Department of Microbiology Saveetha Dental College, Chennai

plasmodic properties. In the stomach, the effect is carminative, relaxing the gastric sphincter, and it encourage eructation. Patients suffering from arthritis, rheumatism and leg ulcers are advised to take clove oil[9].

The aim of the study is to evaluate the antibacterial activity of clove bud oil against staphylococcus aureus.The antibacterial activity is carried out by agar well diffusion technique against the staphylococcus aures and the zone of inhibition is measured in mm diameter. In the present study, clove oil was found to be equally effective against both gram-positive and gram-negative organisms. Thus, our study was indented to determine the antibacterial activity of clove oil against Staphylococcus aureus[11] .

MATERIALS AND METHODS

Bacterial isolates

A total of 20 clinical isolates of S. aureus were collected from different clinical specimens of patients attending Saveetha Medical Collage and hospital. They were processed for a battery of standard biochemical tests and confirmed. Isolates were preserved in semisolid trypticase soy medium and stored at 4ºC until further use.

Antibiotic susceptibility test

Antibiotic susceptibility testing was determined for these isolates to the following antibiotics such as penicillin, erythromycin, clindamycin, ciprofloxacin, tetracycline, cotrimoxazole and linezolid. These antibiotics were procured from Himedia, Mumbai. This was performed by Kirby-bauer disc diffusion method as per CLSI guidelines. [16]

Detection of antibacterial activity of clove oil against clinical isolates of S. aureus

Anti-bacterial activity of clove oil was tested against S. aureus isolates by minimum inhibitory concentration method. Mueller Hinton broth was supplemented with 0.002% (V/V) tween 80 (HiMedia, Mumbai) to enhance the dispersion of the essential oil. Agar dilution method was performed to attain the different concentrations of essential oils such as 0.03%, 0.06%, 0.125%, 0.25%, 0.5%, 1% and 2% in Mueller Hinton Agar (MHA). Media containing various concentrations of essential oil were poured over the sterile petridishes and allowed to dry. Media without essential oil was served as control plate. Spot inoculation of 0.5 McFarland standard turbidity adjusted isolates were made on the plates and incubated at 37ºC for overnight. The lowest concentration of the essential oils that completely inhibited the growth of isolates was considered as MIC. [17]

RESULTS

Sample wise distribution of clinical isolates of S. aureus

Of 20 clinical isolates of *S. aureus*, 8/20 (40%) were obtained from pus, 6/20 (30%) were from wound, 4/20 (20%) and 2/20 (10%) were from blood and sputum respectively (Figure 1).

Antibiotic susceptibility pattern

We have observed a varied pattern of sensitivity among one *S. aureus* isolates.

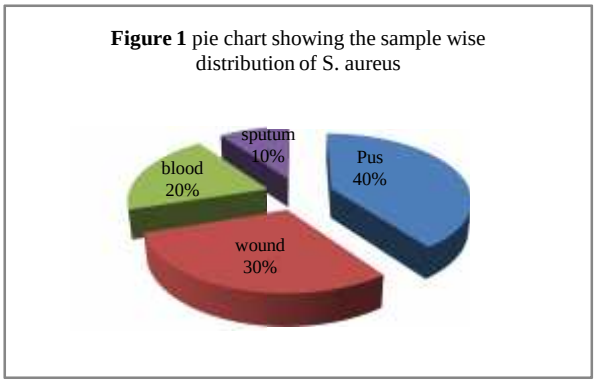

Figure 1 pie chart showing the sample wise distribution of S. aureus

There was complete resistance observed for penicillin (100%), 9/20(45%) isolates were shown to the resistant to erythromycin, 6/20(30%) were to cotrimoxazole, 4/20(20%) were to linezolid followed by 3/20(15%) were resistant to ciprofloxacin and clindamycin respectively (Table 1) (Figure 2).

Table 1 Results of antibiotic susceptibility pattern of *S.aureus*

Antibiotics	Sensitive(%)	Intermediate(%)	Resistant(%)
Penicillin	0	0	20(100)
Erythromycin	14(70)	4(20)	2(10)
Clindamycin	15(75)	2(10)	3(15)
Ciprofloxacin	9(45)	8(40)	3(15)
Tetracyclin	14(70)	4(20)	2(10)
Cotrimoxazole	10(50)	4(20)	6(30)
Linezolid	10(50)	6(30)	4(20)

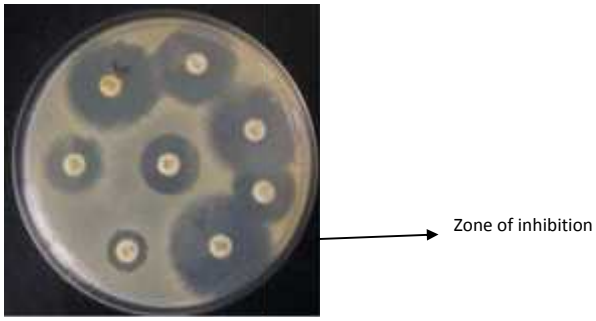

Figure 2 Representative picture showing antibiotic sensitivity pattern of *S.aureus*

Result of antibacterial activity of clove oil against clinical isolates of S.aureus

We have observed that, clinical isolates of S. Aureus were inhibited from 0.125-1% of clove oil.

The MIC of clove oil was appeared to be 0.125% for S. aureus.

Dilutions of Clove oil	0.03%	0.06%	0.125%	0.25%	0.5%	1%	2%
No. of organisms	0	0	8 (40%)	6 (30%)	3 (15%)	3 (15%)	0

DISCUSSION

Study conducted by Prakasam *et al* from Chennai in 2014 demonstrated that, Acinetobacter strains were inhibited from 0.06 to 0.25%, 0.25-1% and 0.125-1% for clove, peppermint and eucalyptus oils respectively. In clove oil, 14/50 (28%) isolates were inhibited at 0.06%, 25/50 (50%) at 0.125% and 11/50 (22%) at 0.25% of clove oil. In peppermint oil, 34/50 (68%) isolates were inhibited at 0.25%, 12/50 (24%) and 4/50 (8%) were at 0.5% and 1% concentrations of peppermint oil respectively. In eucalyptus oils, 10/50 (20%) isolates were

inhibited at 0.125%, 18/50 (36%) at 0.25%, 16/50 (32%) and 6/50 (12%) were at 0.5% and 1% respectively. Thus, the MIC of clove oil was found to be 0.06%, 0.25% for peppermint oil and 0.125% for eucalyptus oil. [17]

In contrast, in our study, we used clove oil against Enterococcus isolates. 40% of isolates were inhibited at 0.125%, 30% were at 0.25%, 15% were at 0.5% and 15% were at 1% of essential oil. Thus, the MIC of clove oil against Enterococcus isolates was found to be 0.125%.

CONCLUSION

The clove oil was found to have antibacterial activity against S. aureus. However, its irritant properties has been evaluated before it is formulated for medicinal purpose. Due to the extended drug resistance in S. aureus, it can be used as an alternative medicine. Spices have been declared as powerful antibacterial agents and hence must be used appropriately. The use of spices in dentistry should be based on evidence of effectiveness and safety. The antibacterial activities could be enhanced if active components are purified and adequate dosage determined for proper administration[14].

References

1. Prabuseenivasan, S.; Jayakumar, M.; Ignacimuthu, S. (2006). *In vitro* antibacterial activity of some plant essential oils. *BM Complementary Altern. Med.* 6, 39.
2. Tajkarimi, M.M.; Ibrahim, S.A.; Cliver, D.O. (2010). Antimicrobial herb and spice compounds in food. *Food Control* 21, 1199-2.
3. Burt, S. (2004). Essential oils: their antibacterial properties and potencial applications in foods-a review. *Int. J. Food Microbiol*. 94, 223-253.
4. Holley, R.A., Patel, D. (2005). Improvement of shelf-life and safety of perishable foods by plant essential oils and smoke antimicrobials. *Food Microbiol*. 22, 273-292.
5. Rahim ZH, Khan HB. Comparative studies on the effect of crude aqueous (CA) and solvent (CM) extracts of clove on the cariogenic properties of *Streptococcus mutans*. *J Oral Sci* 2006; 48(3):117-23.
6. Duke JA. Handbook of Medicinal Herbs. New York: CRC Press; 1985. p. 468-9.
7. Sureshbabu S, Madhavi M. Green Remedies. New Delhi: Pustak Mahal; 2001. p. 74-5.
8. Lueng AY, Foster S. Encyclopaedia of Common Natural Ingredients: Used in Food, Drugs and Cosmetics. 2 nd ed. New York: John Wiley and Sons; 1996.
9. Bisset NG. Herbal Drugs and Phytopharmaceuticals. Boca Raton, FL:
10. Sweta VR, and Geetha RV. "In vitro antibacterial activity of clove and pepper on streptococcus mutans." *in vitro* 8.5 (2015).
11. Nor Syakirah Binti Shahroom*, Vishnu Priya V**, Geetha RV***. *IBDS; *In vitro* Evaluation of Antibacterial Activity of Clove Bud Oil on Bacterial Pathogens;**Associate Professor, Dept of Biochemistry, Saveetha Dental College and Hospitals, Saveetha University, Chennai.
12. Ito, T., Y. Katayama, and K. Hiramatsu. 1999. Cloning and nucleotide sequence determination of the entire *mec*DNA of pre-methicillin-resistant *Staphylococcus aureus* N315. Antimicrob. Agents Chemother. 43: 1449-1458
13. Ma, X. X., T. Ito, C. Tiensasitorn, M. Jamklang, P. Chontrakool, S. Boyle- Vavra, R. S. Daum, and K. Hiramatsu. 2002. Novel type of staphylococcal cassette chromosome *mec*identified in community-acquired methicillin- resistant *Staphylococcus aureus* strains. Antimicrob. Agents Chemother. 46: 1147-1152.
14. Oussalah, Mounia, *et al*. "Inhibitory effects of selected plant essential oils on the growth of four pathogenic bacteria: E. coli O157: H7, Salmonella typhimurium, Staphylococcus aureusand Listeriamonocytogenes." Food control18.5 (2007): 414-420.
15. Hammer, Katherine A., C. F. Carson, and T. V. Riley. "Antimicrobial activity of essential oils and other plant extracts." *Journal of applied microbiology* 86.6 (1999): 985-990.
16. Clinical Laboratory Standards Institution: Performance standards for antimicrobial susceptibility testing. In NCCLS approved standard M2-A8. Wayne, PA USA: CLSI, 2004.
17. Gopinath Prakasam, Manju Bhashini, Lakshmipriya, Srivani Ramesh S. 2014. In-vitro antibacterial activity of some essential oils against clinical isolates of *Acinetobacter baumannii*. *Indian J Med Microbiol*. 32:90-91.

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