



## In vitro Evaluation of Antibacterial Activity of Clove Bud Oil on Bacterial Pathogens

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Accepted on: 12-12-2015; Finalized on: 31-01-2016.

### ABSTRACT

Cloves are famous for its spices and widely used in cooking throughout the world especially in the Europe and Asia. Besides, cloves are also essential in the manufacturing of herbal medicine such as Indian Ayurvedic medicine and Chinese medicine. The health benefits of clove oil can be attributed to its antimicrobial, antifungal, antiseptic, antiviral, aphrodisiac and stimulating properties. The oil is used for treating a variety of health disorders including toothaches, indigestion, cough, asthma, headache, stress and blood impurities. The present study is aimed to determine the antibacterial activity clove oil against various pathogens. The aim of the study is to evaluate the antibacterial activity of clove bud oil against selected bacterial pathogens. The antibacterial activity is carried out by agar well diffusion technique against the bacterial pathogens 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, from this study it can be concluded that clove oil possess antibacterial activity.

**Keywords:** Antibacterial, Clove bud oil, Agar well diffusion, zone of inhibition.

### INTRODUCTION

**S** *zygium aromaticum* [Family: Myrtaceae] or Clove has been used traditionally as a spice for thousands of years, and provides a rich and spicy addition to our favourite recipes<sup>1</sup>. Clove is an evergreen tree, which produces a flower bud that has numerous medicinal properties. It is often referred to as clove bud. Clove bud has a shaft and a head and hence it has the Latin name *clavus*, meaning nail<sup>2</sup>. Cloves are famous for its spices and widely used in cooking throughout the world especially in the Europe and Asia<sup>1</sup>. Besides, cloves are also essential in the manufacturing of herbal medicine such as Indian Ayurvedic medicine and Chinese medicine. Clove is rich in minerals such as calcium, iron, phosphorus, sodium, potassium, and vitamin A and vitamin C. The essential oil of the clove is obtained from the aromatic clove bud, clove stem and clove leaf. 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.

The main constituents of the oil are phenylpropanoides such as carvacrol, thymol, eugenol and cinnamaldehyde<sup>3</sup>. The oil is used for treating a variety of health disorders including toothaches, indigestion, cough, asthma, headache, stress and blood impurities. The most important and common use of clove oil is in dental care. Several toothpastes, mouth wash and oral care medications contain clove oil as an important ingredient. In dentistry, the clove oil is used and act as a painkiller<sup>4</sup>. It is applied to the gum for reducing toothache<sup>4</sup>. Apart from

that, clove oil is a major component of eugenol which is used to reduce pain in the nerves during tooth extraction usually when there is complication known as "dry socket"<sup>5</sup>. Eugenol also forms cement when it is mixed with Zinc Oxide and applied to the tooth as temporary filling of cavities<sup>6</sup>. Clove oils are also used in the production of antibiotics for its antimicrobial properties. They have been screened for their potential uses as alternative remedies for the treatment of many infectious diseases<sup>7</sup>.

There has been an increased interest in looking at antimicrobial properties of extracts from aromatic plants particularly essential oils<sup>7</sup>. Thus, this study is aimed to determine the antibacterial activity clove oil against various pathogens.

### MATERIALS AND METHODS

#### Materials

Clove bud oil [CLB 1503078]. The Bacterial strains used were *E. coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Enterococcus faecalis*. The organisms were obtained from Department of Microbiology, Saveetha Dental College.

#### Methodology

Broth culture of the test organisms compared to Mac Farland's standard 0.5 were prepared. Lawn culture of the test organisms were made on the Muller-Hinton agar [MHA- M1084] plates using sterile cotton swab and the plates were dried for 15 minutes. Well measuring 4 mm depth was made on the agar with sterile cork borer. 100µl of the essential oil is added to the wells. 0.2% of



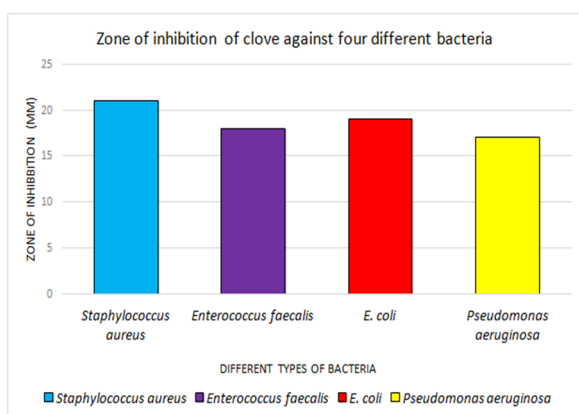
Chlorohexidine was used on the positive control. The plates were incubated overnight and the zone of inhibition of growth was measured in mm diameter. All the test were done in triplicates to minimize the test error.

## RESULTS AND DISCUSSION

The investigation on antibacterial activity of clove oil against two gram positive cocci, *Staphylococcus aureus* and *Enterococcus faecalis*, and another two gram negative bacilli, *E. coli* and *Pseudomonas aeruginosa* was done. The essential oil showed growth of inhibition against both gram positive and gram negative on Muller Hinton Agar (MHA). The zone of inhibition of the four bacteria is recorded and tabulated in Table 1.

**Table 1:** The results of the antibacterial activity on four different microorganisms.

No.	Name of microorganisms	Broth dilution
		Diameter zone of inhibition (mm)
1.	<i>Staphylococcus aureus</i>	21
2.	<i>Enterococcus faecalis</i>	18
3.	<i>E. coli</i>	19
4.	<i>Pseudomonas aeruginosa</i>	17



**Figure 1:** The graph showing zone of inhibition of clove oil against bacterial strains

The essential oil showed favourable result against various bacterial strains tested. *Staphylococcus aureus* showed the maximum susceptibility towards the clove bud oil with 21mm zone of inhibition. The antibacterial activity of clove oil against *E. coli* showed zone of inhibition 19mm.

With *Enterococcus faecalis* and *Pseudomonas aeruginosa*, the zone of inhibition was 18mm and 17mm respectively.

## CONCLUSION

In the present study, clove oil was found to be equally effective against both gram-positive and gram-negative organisms.

So from this study it can be concluded that clove oil possess antibacterial activity.

It can be used as antibacterial supplement in the developing countries towards the development of new therapeutic agents.

Additional *in vivo* studies and clinical trials would be needed to justify and further evaluate the potential of this oil as an antibacterial agent in topical or oral applications.

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Source of Support: Nil, Conflict of Interest: None.