COMPARATIVE STUDY OF CLOVE OIL AGAINST BACTERIA AND FUNGAL SPECIES

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ABSTRACT:

The present study was carried out to evaluate the antimicrobial activity of clove oil extracted from clove. Screening for antibacterial and antifungal of clove oil was done using agar well diffusion. Four Bacterial and ten fungal species were taken. According to the result clove oil was more effective against Bacteria as compared to Fungi. We can conclude by this study that clove oil works better as antibacterial. It was also observed that by increasing concentration of clove oil the growth of fungi was decreased.

Keywords: *Antimicrobial activity and Agar well diffusion.*

INTRODUCTION

The Modern Age of technology and globalization has always kept the herbal and traditional Medicines in an adorable and trusted position. Reason for this trust for herbs and natural products is the decreasing efficiency of conventional medicines to some extent. Spices are always a better alternative to use it against bacterial and fungal infection. Indian culinary traditions includes more use of spices in food. Indian kitchens are considered as first Hospitals. The botanical name of clove is *Syzygium aromaticum* and common name is Laung, Lavang. It is aromatic flower buds of tree of family Myrtaceae. Clove tree is an evergreen tree, that grows 8-12 m tall. With large leaves and Sanguine flowers grouped in terminal clusters. Cloves are harvested when buds are 1.5-2.0 cm long calyx, that terminates in four spreading sepals and four unopened petals that form a small central ball.

CLOVES are used in **Kitchen** as spice and flavoring agent and **as a Dental wash** which inhibits the growth of *Porphyromonas gingivlis* and *Prevotella intermedia*. It is used as antiseptic and disinfectant and so many

Chemical Composition of Clove is volatile oil- **14 to 20%,** Gallotannic acid- 10 to 30%, Oleanolic acid, Vannilin, Eugenin. Clove oils are composed of- Eugenol (80-95%),

Eugenyl acetate (1-5%) and Beta caryophyllene (4-12%). Anti microbial activity of clove oil is largely due to presence of Eugenol and the main chemical components of clove oils are eugenol, acetyl eugenol, iso-eugenol and β-caryophyllene (Fichi et al., 2007; Silva & Fernandes, 2010; Rahimi et al., 2012). The phenolic compounds which are obtained from oil are responsible for the antibacterial and antifungal activity. The present study was carried out to evaluate and compare the antibacterial and antifungal activity of clove oil.

METHODOLOGY

- Isolation of clove oil (Hydrodistillation)

Clove buds (75 gram) were washed, dried and then weighed. Buds fed inside round bottom flask Clevenger apparatus and the assembled apparatus was allowed to work for 8 hours.

After extraction of clove oil by Clevenger apparatus (Fig-2) it was collected and stored in closed glass test tube at 4˚C (fig-1).

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Figure-1: Showing oil

Figure- 2: Clevenger apparatus

Bacteria used were: *Eschrechia coli, Bacillus cereus, Brevundimonas diminuta and Bacillus thirungenesis.*

Fungi used were: *Aspergillus fumigatus, Aspergillus. flavus, Aspergillus. nidulus, Aspergillus niger, Alternaria alternata, Alternaria crassa, Penicillium notatum, Penicillium Meleagranum var viridiflavum, Penicillium multicolor and Penicillium citrinum*

Inoculation method (Agar well diffusion)

- Each strain was poured in two petri plates.
- One plate inoculated with each of the strains with oil.
- Other kept as control without oil.
- Inoculation of clove oil was done in three wells **50µl, 75µl and 100µl,** in same plate, with the help of micropippete and punching tube in Laminar hood.

All the bacterial plates were incubated at 37 ˚Cfor 24 hours and fungal plates at 28° C for 3 days.

RESULTS AND DISCUSSIONS

Clove oil is found to be more effective against bacteria as compared to fungi as a whole. Oil was found to be more effective against *E.coli*, as compared to *B.cereus* & *B. diminuta*, whereas, it was not at all effective against *Bacillus thirungenesis*. At 75 µl and 100 µl clove oil showed good antibacterial activity. However 50 µl **of** oil was least effective (Table- 1, Figure- 3,4,5). Among fungi *Penicillium multicolor, Aspergillus niger, Alternaria crassa*, *Penicillium citrinum* and *Penicillium Meleagranum var viridiflavum* was resistant to clove oil. Least activity was found against *A.fumigatus* than rest of the four fungal strains. However in high concentration it was able to inhibit fungal growth. Inference can be drawn that essential oil of clove is more effective on bacteria than fungi. Maximum zone of inhibition was shown against *Aspergillus nidulan* at 100 µl. Clove oil tested against the bacterial and fungal strains, it was concluded by Radhika and Kamal Rai aneja (2010) that clove oil emerged as the potent agent exhibiting even much higher antibacterial and antifungal activity than the standard antibacterial and antifungal drugs ciprofloxacin and amphotericin-B respectively. They tested clove oil against five dental caries causing microorganisms namely *Streptococcus mutans*, *Staphylococcus aureus*, *Lactobacillus acidophilus* (bacteria), *Candida albicans* and *Saccharomyces cerevisiae* (yeast).

Table 1: Zone of inhibition measurement at different concentrations

Name of Bacteria	50 µl	75 µl	100µl
E.coli	10mm	20mm	28mm
Bacillus cereus	8mm	15mm	24mm
Brevundimonas diminuta	8mm	18mm	24mm
Bacillus Thirungenesis	No effect	No effect	No effect

Table 2: Zone of inhibition measurement at different concentrations

Name of Fungi	50 µl	75 µl	100 µl
Aspergillus nidulans	No effect	No effect	18mm
Alternaria alternata	No effect	6mm	18mm
Aspergillus flavus	No effect	No effect	10mm
Penicillium notatum	No effect	6mm	8mm
Aspergillus fumigatus	No effect	No effect	6mm
Alternaria crassa	No effect	No effect	No effect
Aspergillus niger	No effect	No effect	No effect
Penicillium citrinum	No effect	No effect	No effect
Penicillium multicolor	No effect	No effect	No effect
Penicillium meleagrinum var. viridiflavum	No effect	No effect	No effect

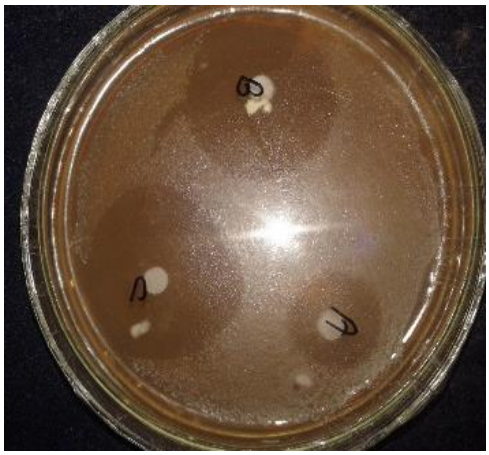

Fig. 3*:* *B.cereus*

Fig. 4: *Brevundimonas diminuta*

Fig 5: *E.coli*

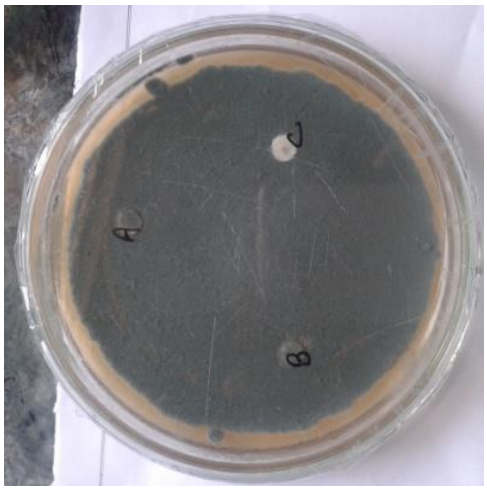

Fig 6: *Aspergillus fumigatus*

Fig 7: *Aspergillus nidulans*

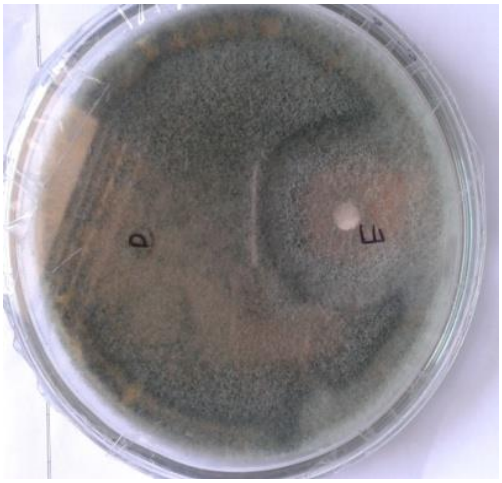

Fig 8: *Alternaria alternata*

According to Baraka and his coworkers (2011), clove oil inhibits the growth mycelium and they found effective against *F. oxysproum, F.solani, F. monliforme, T. paradoxa, B. theobromae and R.solan.* Our presents study results also agrees with the statement as it was effective for some fungi, but in higher concentration. May be on increasing concentration it will be effective against the other fungi as well. Hitokoto et al. (1980), showed that eugenol extracted from powdered cloves completely inhibited the growth of both *Aspergillus flavus* and *Aspergillus versicolor* at a concentration of 250 µg/mL. In 2011 Rana and his coworkers tested the antifungal activity of clove oil on many fungi and they found it to be effective.

CONCLUSION:

In today's world the use of herbal products are increasing. Clove which has been chosen by us during investigations has given positive result for Bacteria. Clove oil showed inhibitory effect against all bacteria. For bacteria, it was more effective. For fungi, it was effective only at higher concentrations.

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