

Evaluation of Antimycotic Activity of Three Essential Oils on *Candida Albicans* -An Invitro Study

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Abstract

Aim: To evaluate the invitro antimycotic activity of Rosemary oil, Tea tree oil and Cinnamon oil on *Candida albicans*.

Background:

Candidiasis is caused due to mycotic activity of *Candida albicans* present in oral cavity. Initial bacterial colonization, plaque evolves to contain a variety of microorganisms, including *Candida* species, many of which are potential periodontal pathogens. Essential oils namely Tea tree oil, Cinnamon oil and Rosemary oil are found to have good antimycotic activity on *Candida albicans*.

Method:

The antimycotic activity of three essential oils against *Candida albicans* determined using agar well diffusion technique.

Result: The investigation of anti mycotic activity of essential oils on *Candida albicans* was done by agar well diffusion technique and its zone of inhibition was evaluated.

Keywords : antimycotic, *Candida*, essential oils.

INTRODUCTION:

Plant oil and extracts have been well recognised for their antimicrobial properties for many years [1]. Rosemary, scientifically labeled as *Rosmarinus officinalis* L., is a small perennial shrub of the mint family [2]. Rosemary oil is essentially the extract of a small light blue flower along with the extract from the leaves to yield the fragrance of the essential oil, which is sometimes used as an ingredient in perfumes as well as for a food flavoring. Rosemary oil has a powerful, refreshing herbal smell with the appearance of clear water and a viscous texture [3].

Tea tree oil is produced by steam distillation of the leaves and terminal branches of *Melaleuca alternifolia*. Once condensed, the clear to pale yellow oil is separated from the aqueous distillate. The yield of oil is typically 1 to 2% of wet plant material weight [4]. Tea tree oil is composed of terpenic hydrocarbons, mainly monoterpenes, sesquiterpenes and associated alcohols [5]. Tea tree oil has broad antimicrobial activity and is incorporated into a diverse range of pharmaceutical and cosmetic products [6].

Cinnamon oil is prepared from the dried bark of the roots of *Cinnamomum zeyloriaceae* [7]. Cinnamon oil has a very good antimicrobial, anti-inflammatory and antioxidant properties [8]. Inhalable Cinnamon vapours appear to approach the ideal chemotherapy for respiratory tract mycoses [9]. Cinnamon oil showed also a significant inhibitory effect on hydroxyl radicals and acted as an iron chelator [10].

Candida albicans is found in infections of the mouth, vagina, lungs, and in skin lesions [11]. Initial bacterial colonization, plaque evolves to contain a variety of microorganisms, including *Candida* species, many of which are potential periodontal pathogens [12]. *Candida albicans* is the most common causative agent of oral candidiasis in human immunodeficiency virus infected patients [13]. Also several conditions, such as

hyposalivation, diabetes mellitus and prolonged antibiotic and corticoid therapy can predispose to oral candidiasis [14]. The aim of this study is to evaluate the antimycotic activity of Cinnamon oil, Rosemary oil and Tea tree oil on *Candida albicans*.

MATERIALS:

Tea tree oil, Cinnamon oil and Rosemary oil were obtained commercially. The strain of *Candida* was cultured from lactic acid at 37°C in Department of Microbiology at Saveetha Dental College, Chennai.

METHODOLOGY:

Agar well diffusion method

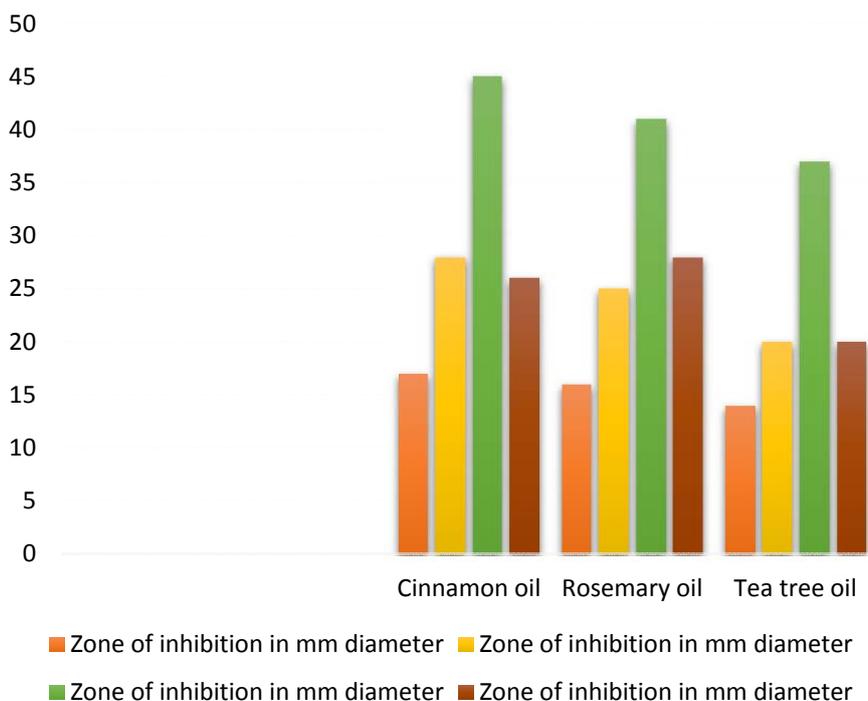
Broth culture of the test organisms compared to MacFarland's standard 0.5 were prepared. Lawn culture of the *Candida albicans* strains were made on the Muller-Hinton agar [MHA- M1084] plates using sterile cotton swab and the plates were dried for 15 minutes [15]. Well measuring 4 mm depth was made on the agar with sterile cork borer. Different concentrations of the essential oils (250 µg/ml, 500 µg/ml and 1000 µg/ml) were added to the wells. 0.2% of Chlorohexidine was used on the positive control. The plates were incubated at 37°C for 24 hrs and the zone of inhibition of growth was measured in millimeter diameter. All the tests were done in triplicate to minimize the test error.

RESULTS:

The investigation on antimycotic activity of Essential oils namely Cinnamon oil, Rosemary oil and Tea Tree oil against *Candida albicans* was done by agar well diffusion technique. The zone of inhibition in three different concentrations of essential oils on the stains along with control is recorded and tabulated in Table 1.

Table 1: Diameter of Zones of Inhibition

Essential oils	Zone of inhibition in mm diameter			
	250µl/ml	500µl/ml	1000µl /ml	Control
Cinnamon oil	17	28	45	26
Rosemary oil	16	25	41	28
Tea tree oil	14	20	37	20

Graph 1 : Graph representing Diameter of Zone of inhibition by essential oils

At 1000µl /ml concentration Cinnamon oil showed a maximum zone of inhibition of 45mm, followed by Rosemary oil with 41mm and Tea tree oil with 37mm than the control chlorohexidine against *Candida albicans*. At 500µl /ml, the zone of inhibition for cinnamon oil is 28mm while its 25mm and 20mm for rosemary oil and tea tree oil respectively. At 250 µl /ml the zone of inhibition for cinnamon oil is 17mm, rosemary oil is 16mm and tea tree oil is 14 mm. The results obtained from our study shows that the essential oils (Cinnamon oil, Rosemary oil and Tea Tree oil) have got a good antimycotic activity against *Candida albicans* when compared with control. Cinnamon oil has a high zone of inhibition and is very effective in controlling growth of *Candida albicans* (graph 1).

DISCUSSION:

Quale, J. M. Et al found 5 patients with infection and oral candidiasis received a commercially available cinnamon preparation for one week, Three of the five patients had improvement of their oral candidiasis [16]. The susceptibility of econazole-SDD isolates from *Candida albicans* to cinnamon oil was higher than other essential oils used [17]. Pires, R. H. Et al reported the most active essential oil was cinnamon oil (CO), which showed anticandidal activity against *C. orthopsilosis* and *C. parapsilosis* in suspension and biofilm cultures [18].

Rosemary oil was found to be more active against the pathogenic fungi and drug resistant mutants of *Candida albicans* [19]. The components of rosemary essential oil would have an effect on its antifungal activity on *Candida albicans* [20]. Hammer, K. A. reported Tea tree oil and components exert their antifungal actions by altering membrane properties and compromising membrane-associated functions [21]. Tea Tree Oil and its component terpinen-4-ol may have the potential of therapeutic ability for mucosal candidiasis which may also be applicable to *C. albicans* oral candidiasis induced by the azole-resistant strain [22]. Jandourek, A. Et al evaluated that Melaleuca oral solution appears as an effective alternative regimen for AIDS patients with oropharyngeal candidiasis [23]. Hence the secondary metabolites of plants were found to be source of various phytochemicals that could be directly used as intermediates for the production of new drugs

CONCLUSION:

Medicinal plants are believed to be important source of new chemical substances with potential therapeutic effects.. Hence the present study has shown the antimycotic activity of Cinnamon oil, Rosemary oil and Tea Tree oil on *Candida albicans*. Anti-mycotic activities could be enhanced if essential oils are purified and used as an additional ingredient in mouthwashes and tooth paste.

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