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RESEARCH ARTICLE

A STUDY OF THE ANTIMICROBIAL ACTIVITY OF TEA TREE OIL

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ABSTRACT

Aim & Objective: To assess the antimicrobial activity which can be conducted with the help of tea tree oil.
Background: Melaleuca alternifolia, also known as tea tree oil, is a commonly used antiseptic. It's a safe yet effective antiseptic in its action. Its chemical composition is extremely complex. These constituents of tea tree oil is what gives it its antiseptic as well as antimicrobial activity.
Reason: It is found that microorganisms are beginning to become resistant to the antimicrobials which used to be used often. So it's essential to know the antimicrobial effect of substances which haven't been utilised for such activities that are possess.
Result: The antimicrobial activity of tea tree oil on Escherichia coli, Enterococcus, Staphylococcus aureus and Pseudomonas was studied.

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INTRODUCTION

The essential oil obtained from the plant Melaleuca alternifolia, known as tea tree oil, has a long history of its usage as an antiseptic in cases of topical application (Markham, 1999). It has been recently found that it is a natural, safe and an effective antiseptic which led to its increased popularity and current incorporation as the principal antimicrobial or as a natural preservative in cosmetic and pharmaceutical products which are used for topical application (Cox *et al*., 2000). Essential oils are known to contain antimicrobial properties and this is due to the presence of constituents of active monoterpenes (Knobloch *et al*., 1988; Beylier, 1979; Morris *et al*., 1979). It was found that monoterpenes exert damaging effects on the membranes (Sikkema *et al*., 1995). Tea tree oil chemical composition has been well defined and consists of cyclic monoterpenes largely of which 50% of the constituents are oxygenated and remaining 50% are hydrocarbons (Brophy *et al*., 1989). The antimicrobial activity of tea tree oil is prinicipally attributed to the compound, terpinen-4-ol (Southwell *et al*., 1993; Carson and Riley, 1995). There may be changes in composition of tea tree oil during storage with increasing levels of ceymene and decrease in levels of terpinene (Brophy *et al*., 1989). The components in tea tree oil in vitro may have synergistic or antagonistic interactions has been explored in vitro (Cox *et al*., 2001). Tea tree oil may act in a synergistic manner with other essential oils like lavender (Cassella *et al*., 2002) and components of essential oils such as beta-triketones from manuka oil (Christoph *et al*., 2001; Christoph *et al*., 2001). Staphylococcus aureus is a microorganism predominantly found in hospital based setups (Wisplinghoff *et al*., 2004). Enterococci are members of flora found in human's intestine, but are the major causes for highly antibiotic resistant, hospital acquired infections (Shankar *et al*., 2002). Pseudomonas aeruginosa is the most commonly found microorganism in hospital setups and have antimicrobial and multi drug resistance (Driscoll *et al*., 2007). An effective topical application is important even in the hospital set up for wound dressing that prevent the spread and contamination of the environment. Spreading of Pseudomonas and staphylococcus aureus occurs in hospital based setups and by means of hospital based infections.

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MATERIALS AND METHODS

It is an invitro study done by disc diffusion method. The Tea tree oil is impregnated in paper disc and placed on Mueller Hinton Agar (MHA). Its antibacterial activity is tested against Escherichia coli, Pseudomonas, Staphylococcus aureus, Enterococcus sp, 0.2 % Chlorohexidine soaked in the disc is taken as positive control

Preparation of the disc: Plain paper disc measuring 6 mm diameter is bought from Himedia laboratory. It is sterilized in hot air oven at 160°c for 60 minites.

Culture suspension: Isolated colony of the organism is inoculated to the nutrient agar and incubated overnight. The colonies were emulsified in sterile normal saline with turbidity

matching 0.5 McFalard standard. Using a swab the suspension is spread on the Mueller- Hinton agar like a lawn culture. The sterile discs soaked in the test solution and Chlorohexidine (0.2 % concentration). Then the discs were taken and placed on a sterile petridish and dried in hot air oven for 15 minutes. Then the dried discs were placed in the MHA coated with the test organism. The plates were incubated at 37° C overnight aerobically. After incubation, the plates were checked for the zone of inhibition. The zone is measured in mm using a scale

RESULTS

Table showing mean zone of inhibition of tea tree oil against the bacteria tested

S. No.	Test organism	Number of Tea tree oil discs	Number of Chlorohexidine discs	Mean Zonesize of inhibition of tea tree oil	Zone of inhibition of Chlorohexidine
1.	Escherichia coli	5discs	1disc	30mm	20mm
2.	Pseudomonas	5discs	1disc	---	20mm
3.	Staphylococcus aureus	5discs	1disc	34mm	19mm
4.	Enterococcus	5discs	1disc	27mm	19mm

DISCUSSION

In the study conducted, it was found that the antimicrobial activity of tea tree oil on Staphylococcus aureus, Escherichia coli and Enterococcus is extremely good. It was found to have more antimicrobial activity than 0.2 % Chlorohexidine, control which is used as standard. Chlorohexidine is known have a quicker kill rate than other antimicrobials and also inactivates microorganisms of a broader spectrum. Hence, tea tree oil can be used as a topicalantimicrobial agent. It was also found that the antimicrobial activity of tea tree oil on Pseudomonas aeruginosa, was completely ineffective. As Pseudomonas is most prevalent in a hospital setup and hospital acquired infections, tea tree oil can't be used as an antiseptic in hospital setupsespecially in Pseudomonas containing wound.

Conclusion

Microorganisms have the ability to develop resistance when exposed to a particular agent for a longer time. Recent studies have proved that microorganisms develop resistance to drugs, resistance to chemical agents and also show resistance to the environmental factors. Some strains are referred to as MDR strains. Developing an alternative mode using plant products may help in solving this issue. The antimicrobial action of tea tree oil is a topic which has not been researched in detail. Although tea tree oil has been found to have extremely powerful antimicrobial activity on certain microorganisms, it has been seen that this action doesn't extent to all microorganisms. Further more research can be done on tea tree oil so that a new antimicrobial agent can be utilized in the near future.

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