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Research Article

ANTIBACTERIAL ACTIVITY OF EUCALYPTUS OIL AGAINST CLINICAL ISOLATES OF PSEUDOMONAS AERUGINOSA

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ABSTRACT

Eucalyptus is a tall, evergreen tree, local to Australia and Tasmania, effectively presented around the world, now broadly developed in numerous different nations including India. It found to different properties like anti bacterial, antifungal, anti cancer etc. Thus, the aim of this study was to examine the in vitro antimicrobial activities of essential oil of the leaves of Eucalyptus globulus (E. globulus) against pseudomonas aeruginosa. We have observed that, clinical isolates of P. aeruginosawere inhibited from 0.25-2% of eucalyptus oil.The MIC of ginger oil was appeared to be 0.25% for P.aeruginosa. The eucalyptus oil is found to have antibacterial activity against P. aeruginosa.

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INTRODUCTION

Eucalyptus is one of the world's vital and most broadly planted genera. It is a tall, evergreen tree, local to Australia and Tasmania, effectively presented around the world, now widely planted in numerous different nations. The Myrtaceae family incorporates 140 genera and around 3800 species dispersed in tropical and subtropical locales of the world [1]. Eucalyptus is one of the world's essential and most generally planted genera. It is a tall, evergreen tree, local to Australia and Tasmania, effectively presented around the world, now widely planted in numerous other countries. Eucalyptus species are notable as restorative plants due to their medicinal and pharmacological properties. In the universal pharmacopeia, the most critical and spoke to species, be that as it may, is Eucalyptus Globulus (E. globulus) which is the principle furnisher of basic oils [2]. These fundamental oils are in great request in the market, since they discover applications as soporific, anodyne, germicide, astringent. Its unpredictable oil is acquired by steam refining and correction from the crisp leaves or the new terminal branches. Eucalyptol is the dynamic element of the eucalyptus oil, in charge of its various pharmacological activities.Oil of eucalyptus has been generally utilised as a part of Ayurveda as a clean and for respiratory tract diseases. Besides, Nadkarni has reported its antibacterial action. However, much logical information is still not accessible with respect to its antibacterial activity [3].

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The spread of drug resistant microbial pathogens is one of the most serious threats to successful treatment of infectious diseases. Pseudomonas aeruginosa artful pathogens that cause extreme and life-debilitating diseases in immunocompromised patients [3]. The Gram-positive bacterium P. aeruginosa is principally in charge of post agent wound infection, shock syndrome and food poisoning. Eucalyptus intertexta and Eucalyptus largiflorens are two developed and adjusted Eucalyptus species in warm districts of Iran, Kashan. To the best of our insight, the compound organisation of their fundamental oil is beforehandreported; however there is no give an account of antimicrobial profiles of these two species. Along these lines, in this review, the in vitro antimicrobial exercises of their fundamental oil, its principle part and concentrates, were assessed against an arrangement of 11 microorganisms.

Germicidal substances are utilised as a part of different circumstances by acting at different destinations of the microbial cell with bactericidal or bacteriostatic activity, and vital lingering effect. There are germicide operators, for example, chlorhexidine are employed ideally for antisepsis of skin [4], mucosa and catheters, while disinfectants like hypochlorite might be utilised for cleaning ledges and semi-basic or non-basic items. The aimless utilisation of germicidal effects in the survival type of microorganisms, especially microscopic organisms, which have built up various components to beat the capable antimicrobial operators, from creating proteins to inactivate drugs until hereditary transformations and its transmission to new bacterial generations [5].

Fundamental oils (additionally called unpredictable oils) are sweet-smelling sleek fluids acquired from plant materials (blooms, buds, seeds, leaves, twigs, bark, herbs, wood, leafy foods). They can be gotten by expression, maturation or extraction yet the technique for steam refining is most normally utilised for business creation. An expected 3000 fundamental oils are known [6], of which 300 are financially imperative in scent advertise. Basic oils are Complex mixers including many single mixes. Synthetically they are gotten from terpenes and their oxygenated compounds. Each of these constituents adds to the gainful or risky impacts [7].

MATERIALS AND METHOD

Bacterial isolates

A total of 20 of non-repetitive clinical isolates of *Pseudomonas aeruginosa* were collected from Saveetha Medical College, Thandalam. They were processed for a battery of standard bio chemical tests and confirmed. Isolates were preserved in semi-solid trypticasesoy broth stock and stored at 4°C until further use.

Antibiotic susceptibility testing

Antibiotic susceptibility testing was determined for this isolates to routinely used antibiotics such as to piperacillin-tazobactam, cefotaxime, ceftazidime, tetracyclin, cotrimoxazole, aztreonam, gentamicin and imipenem by Kirby Bauer disc diffusion method as per CLSI guideline. [8]

Detection of antibacterial activity of eucalyptus oil against clinical isolates of Pseudomonas aeruginosa

Anti-bacterial activity of eucalyptus oil was tested against P. aeruginosaisolates by minimum inhibitory concentration method.Mueller Hinton broth was supplemented with 0.002% (V/V) tween 80 (HiMedia, Mumbai) toenhance the dispersion of the essential oils. Agar dilution method was performed to attain thedifferent 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 oils 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.

RESULTS

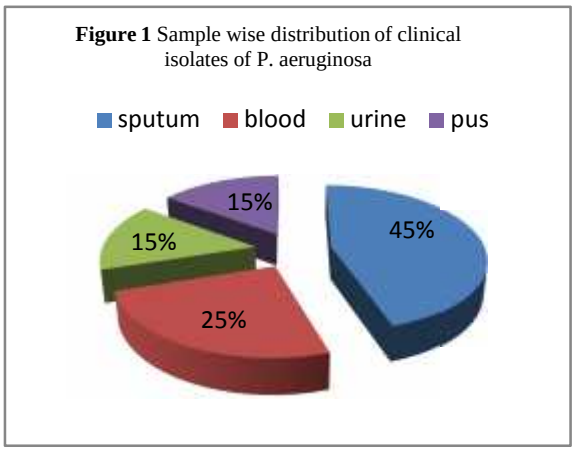

Figure 1 Sample wise distribution of clinical isolates of P. aeruginosa

Sample wise distribution of clinical isolates of P. aeruginosa

Of the 20 clinical isolates of *P.aeruginosa*, 9/20 (45%) isolates were from sputum, 5/20 (25%) from blood, 3/20 (15%) from urine, 3/20 (15%) from pus.

Results of antibiotic susceptibility testing

In our isolates, we have observed that an increased percentage of isolates have shown to be resistant to most of the routinely used antibiotics. Only 2/20 (10%) isolates showed sensitivity to imipenem. Other than that, for all other antibiotics such as piperacillin-tazobactam, cefotaxime, ceftazidime, tetracycline, cotrimoxazole, aztrionum, gentamicin isolates showed complete resistance 20/20 (100%). The detailed resistant pattern of P. aeruginosa isolates were showed in table1.

Table1 Results of antibiotic susceptibility pattern of P. aeruginosa

Antibiotics	Sensitivity(20) (%)	Intermediate(20) (%)	Resistant(20) (%)
piperacillin-tazobactam	0(0)	0(0)	20(100)
Cefotaxime	0(0)	0(0)	20(100)
ceftazidime	0(0)	0(0)	20(100)
tetracycline	0(0)	0(0)	20(100)
cotrimoxazole	0(0)	0(0)	20(100)
Aztreonam	0(0)	0(0)	20(100)
Gentamicin	0(0)	0(0)	20(100)
Imipenem	2 (10)	1 (5)	17 (85)

Result of antibacterial activity of eucalyptus oil against clinical isolates of Pseudomonas aeruginosa

We have observed that, clinical isolates of P. aeruginosawere inhibited from 0.25-2% of eucalyptus oil. The MIC of eucalyptus oil was appeared to be 0.25% for P.aeruginosa.

Table 2 Result of antibacterial activity of eucalyptus oil against clinical isolates of Pseudomonas aeruginosa

Dilutions of eucalyptus oil	0.03%	0.06%	0.125%	0.25%	0.5%	1%	2%
No. of organisms	0	0	0	6 (30)	2 (10)	3 (15)	9 (45)

Fig 2 Representative picture showing MIC of eucalyptus oil against P. aeruginosa

DISCUSSION

A study in Algeria showed that, the expansion of basic oil leaves in broth culture immunised with S. aureus and E. coli

repressed the development of these life forms. The rate of restraint was more prominent, on gram negative microorganisms (E. coli) than that seen on gram positive bacterium (S. aureus) [9]. As a rule the measure of Inoculum and the convergence of fundamental oil leaves influenced the development/survival of the life forms. These outcomes are practically like those appeared by different works on the antimicrobial action of fundamental oil of E. Globulus leaves and in addition those of comparative species, and affirms its customary uses [10,11]. The developments of tests microscopic organisms in high convergences of basic oil leaves were profoundly repressed, where it was viewed as that these life forms were delicate to the oil.

Some authors have reported that gram-negative microorganisms are marginally more delicate to basic oils when contrasted with gram-positive.The gram-positive and gram-negative microorganisms vary in a few angles other than concerning the structure of their cell walls, for the most part as to the presence of lipoproteins and lipopolysaccharides in gram-negative microbes that barrier to hydrophobic compounds [12,13,14]. Some scientists reported that there is a relationship between the chemical structures of the most common in the test basic oil and the antimicrobial movement. The antibacterial action of Eucalyptus concentrates has been because of the segments, for example, 1,8-cineole, acetic acid derivation, p-cymene, eucamalol, limonene, linalool, terpinol, and aromadendrene.

The basic oils from the leaf of E. Globulus demonstrated differing degrees of antibacterial action against two clinical isolates. From the above examination it can be deduced that extract shows development inhibiting consequences for Gram-positive (E. coli) and Gram-negative microbes (S. aureus) [15]. The adequacy of leaf oil of E. Globulus against these microorganisms may give a logical ground to the use of the herb in the aversion and treatment of bacterial contaminations brought about by different pathogenic microscopic organisms, for example, Staphylococcus aureus and Escherichia coli, which have created resistance to anti-infection agents. In our review, cinnamon, clove, geranium, lemon, lime, orange and rosemary oils displayed solid movement againstthe chose bacterial strains [16]. A few reviews have shown that cinnamon, clove and rosemary oils had strongand steady inhibitory impacts against different pathogens. Despite the fact that prior reviews have reported betterantimicrobial action for eucalyptus oil our studyshowed slightest inhibitory movement of eucalyptus in additionto aniseed and camphor oils. Among all oils investigated inthis work, the fundamental oil of cinnamon was the mosteffective as an antibacterial specialist. The antibacterial activity has been credited to the nearness of some dynamic constituents in the oils. Our GC-MS think about revealedcinnamaldehyde to be the real constituent of cinnamon oil [17].

A vital normal for fundamental oils and theircomponents is their hydrophobicity, which empower themto parcel the lipids of the bacterial cell film andmitochondria, irritating the phone structures and renderingthem more penetrable. Broad spillage frombacterial cells or the exit of basic atoms and particles lead to death. Gram-positive microscopic organisms were moreresistant to the basic oils than gram-negative bacteria. In the present review, cinnamon, lime, geranium, rosemary, orange, lemon and clove oils were found to be equally successful against both gram-positive and gram-negative living beings. Among the substances tried in the present review, the Eucalyptus Globulus fundamental oil emerged for its antimicrobial action. In a few tests with gram-negative microorganisms and parasites, its antimicrobial action was like chlorhexidine, yet it was higher than chlorhexidine in tests with gram-positive microorganisms generally connected with medicinal services related infections.The result found is in agreement with the logical literature as of recently created, which tried the Eucalyptus Globulus basic oil at various focuses against strains of Escherichia coli and Staphylococcus aureus. The 100% fundamental oil had the most noteworthy restraint zone when contrasted with alternate fixations tested. The activity of the Eucalyptus Globulus basic oil against strains of Methicillin Resistant Staphylococcus aureus (MRSA) additionally stands out [18,19].

In this review, it was additionally watched that in spite of the fact that papain 10% could create a restraint zone of 1.6 cm in relation to the Candida albicans, this outcome was underneath the zone of hindrance of five centimetres accomplished by chlorhexidine.Similarly, another review tried diverse convergences of papain gel plan in connection to different microorganisms in vitro and the outcomes demonstrated bacterial restraint just in connection to Staphylococcus aureus and Pseudomonas aeruginosa at a concentration of 10%.

Only papain 10% showed antimicrobial effect in relation to Candida albicans, and neither xylitol 10%, nor xylitol 20% showed antimicrobial effect[20]. In contrast, in our study, we used eucalyptus oil against P. aeruginosa isolates. 30% of isolates were inhibited at 0.25%, 10% were at 0.5%, 15% were at 1% and 45% were at 2% of essential oil. Thus, the MIC of tea tree oil against P. aeruginosa was found to be 0.25%.

CONCLUSION

The eucalyptus oil is found to have antibacterial activity against P. Aeruginosa. However, the studies on toxic and irritant properties of essential oils are imperative, especially when considering any new products for human administration. This can be used as alternative and complementary antibacterial agents for controlling the *Pseudomonas* infections.

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