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Antibacterial Activity of Nutmeg Extract and Oil

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Abstract:
Myristica fragrans I.e. nutmeg and its essential oil was studied for its antibacterial activity. The present study revealed that nutmeg essential oil contains some antibacterial activity which may contribute in preparation of drugs in the field of medicine.The present work shows aqueous,acetone and methanol extract of essential oil and extract by agar well diffusion method shows better antibacterial activity in comparison with amikicin as standard antibiotics.Various extracts and the essential oil of nutmeg seeds have presented strong antimicrobial activity against gram-positive and gram-negative bacteria, as well as a variety of fungi.

Keywords: Nutmeg,Myristica fragrans,Agar cup,essential oil antibacterial etc.

Nutmeg is mostly extracted to make nutmeg oil or used as a spice. Both the kernel and the mace can be used to extract essential oils. The dried kernel is referred to as nutmeg, and the dried scarlet fibrous aril that covers the kernel is known as mace. Typically, steam distillation or steam and water distillation is used to extract oil. Nutmeg essential oils are mostly used for flavoring food. Drinks, biscuits, cakes, puddings, candies, and roasted foods like sausages and meat have all benefited from its flavoring use.
The beverage sector uses oils for beer, wine, whisky, and soft drinks similar to cola.
The adding aroma of nutmeg essential oils on these products linked to spicy aroma. Nutmeg essential oils also used in pharmacy due to the antithrombotic, anti-dysentery, anti-inflammatory, rheumatism and narcotic activities,(Olajide, O.A et.al 199)
Morover, nutmeg oil reveals their antibacterial activity. A number of report have been published about these activities. The oils can be effective against gram positive and gram negative bacteria: *Escherichia coli, Aeromonas hydrophila, Salmonella choleraesuis, Pseudomonas aeruginosa, Staphylococcus aureus, Listeria monocytogenes, Listeria innocula*(Dorman, H.J.D. and S.G. Deans. 2004)

Various extracts and the essential oil of nutmeg seeds have presented strong antimicrobial activity against gram-positive and gram-negative bacteria, as well as a variety of fungi. Takikawa et al. (2002) reported antimicrobial activity of ethanolic extract of nutmeg seeds against enterohemorrhagic E. coli O157, which was found to be highly sensitive to b-pinene. Narasimhan and Dhake (2006) reported potent antibacterial activity of chloroform extract of nutmeg seeds against both gram-positive and gram-negative bacteria. They found trimyristin and myristic acid to be the chief antibacterial principles isolated from nutmeg seeds. Cho et al. (2007) isolated three lignans (erythro-austrobailignan-6, meso-dihydroguaiaretic acid, and nectandrin-B) from the methanolic extract of nutmeg seeds, which were reported to have antifungal activity.

Material and Methods

Plant material:Nutmeg seeds and oil were purchased from local market of Bhiwandi (Maharashtra)
Bacterial culture:*S. aureus* and *E.coli* (B.N.N. College,Bhiwandi)
Antibacterial activity of nutmeg oils and extract (zone of inhibition). The nutmeg oils and nut meg extracts were prepared into solutions with concentration of 20%, 40%, 60%, 80% and 100% (v/v) by diluting with aquous,methanol and acetone *S. aureus* and *E.coli* suspension were prepared with cell

content of 3 × 10^8 CFU/ml (absorption in spectrometry was compared with the Mc Farland scale 1 for each microorganism). were cultured on Beef Extract Peptone Agar (NA) medium. With the aid of moist sterile swab the suspensions were spread on plates of Mueller Hilton Agar (MHA). Agar well was made on sterile M.H.Agar and nut meg extract and oil extract of different concentration of aqueous,methanol and acetone incubated at 37□C for 48 h along with standard antibiotic.The results were recorded as zone of inhibition and compared with standard antibiotic Amikacin

Results and Discussion

Table :Antibacterial activity of nutmeg oil and extract compared with Amikacin

Test oranism	Solvent Extract	Concentrations								
		20%	40%	60%	80%	100%	D/W	Methanol	Acetone	Amikacin
		Zone of Inhibition (mm)								
E.coli	Aqueous	---	---	----	---	----	--	-----	----	20
	Methanol+Oil	---	---	---	---	13	---	----	----	
	Acetone+oil	---	9	10	11	13	----	-----	----	
S,aureus	Aqueous	---	---	---	---	---	---	---	---	23
	Methanol+Oil	---	---	---	---	16	---	---	---	
	Acetone+oil	9	11	12	14	16	---	---	---	

Qualitative study of aquous extract of nutmeg and essential oil was done by agar well diffusion method.Different dilution of nutmeg seed and oil diluted with methanol and acetone were tested on standard bacterial culture of Escherichia coli and Staphylococcus aureus.The results obtained is dipicted in the above table.

Pure nutmeg essential oil shows antibacterial activity against both the test organism and the maximum activity was observed at 100% concentration with 16mm zone of inhibition while methanol couldn't exhibited any activity. For acetone and aquous extract of essential oil acetone extract exhibited better activity.

Due to its high antioxidant and antimicrobial activities, nutmeg could be considered as a significant natural source of antioxidants and antimicrobials. Nutmeg, being a natural product, can offer more safety to people and the environment, and is considered to be less of a risk for resistance development by pathogenic microorganisms.

The research demonstrated by Nurjaha et.al(2017) the antibacterial properties of nutmeg oils from Sulawesi and Central Java (*S. aureus, S. epidermis, S. dysenteriae,* and *S. typhi*). When it came to *S. aureus, S. epidermis, S. dysenteriae*, and *S. typhi*, the highest inhibition zone was observed at 60% concentration of the oil (12.96, 16.79, 13.46, and 16.50 mm, respectively) on Central Java nutmeg oil, but it was at 100% concentration (18.84, 16.54, 17.84, and 12.54 mm, respectively) on Sulawesi nutmeg oil. As a result, nutmeg oils may be used as a natural antibacterial product. Sabine, Myristicin, Pinene, and Limonene were the principal constituents of the nutmeg oils.

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