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INVITRO ANTIMICROBIAL ACTIVITY OF GINGER AGAINST HUMAN PATHOGENS

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ABSTRACT

Earlier studies have already showed the potential use of Ginger in the field of traditional medicine. Ginger is used in the preparation of almost all the dishes in Indian and also many parts of the world. In this study five different extracts of Ginger (*Zingiber officinale*) and Mango ginger (*Curcuma amada*) was tested against four pathogens (*Escherichia coli, Staphylococcus sp, Streptococcus sp, Pseudomonas sp*). All the four type of bacteria were isolated from clinical sample and identified by biochemical characterization. Sterile water and organic solvent like butanol, chloroform, ethanol, and methanol were used for the extraction process. Microbial susceptibility assays was done by agar dilution (Mueller-Hinton Agar) method. The extracts of Ginger and mango ginger were effective against all four pathogens, but mango ginger has elevated antibacterial activity than ginger. Also, Ginger potency was highest when extracted by chloroform indicating that active material was extracted better in chloroform. These results imply that these herbs can be used as a source of novel drugs for the treatment of infectious diseases caused by pathogenic microorganisms.

Keywords: Ginger, Antibacterial Agents, Pathogens

INTRODUCTION

Multi-drug resistant strains of Escherichia coli are widely distributed in hospitals and are increasingly being isolated from community **[1, 2]**. Thus, it is urgent need to find out new antimicrobial agents. However, new families of antimicrobial agents will have a short life expectancy **[3]**. For this reason, researchers

are increasingly turning their attention to herbal products, looking for new leads to develop better drugs against multidrug resistant microbe strains **[4]**. Spice plants and essential oils extracted from them have become important due to their potential antimicrobial **[5-7]** and stimulating effects in the animal digestive system. The antimicrobial effectiveness of mustard, clove, cinnamon and their essential oils were reported for the first time around 1880's. Antimicrobial effectiveness of spices depend on the kind of spice, its composition and concentration, type and concentrations of the target microorganism, substrate composition, and processing and food storage conditions **[8]**. Spice plants have been used traditionally as coloring agents, flavoring agents, preservatives, food additives and as well as ntiparasitic, antihelmintic, analgesic, expectorant, sedative, antiseptic and anti-diabetic substances in many parts of the world **[9, 10]**. In addition, they possess biological activities such as that of antioxidants **[11]** and hypocholesterolemics **[12]**.

Ginger (Zingiber officinale) is a perennial plant of South East Asian origin and has been used as a food and medicine since ancient times. Ginger is widely used all over the world as a spice and condiment in daily cooking. It is a natural food component with many active phenolic compounds such as shagaol and gingerol, and it has been shown to have anti-cancer and antioxidant effects **[13, 14]**. The main use of mango ginger is in the manufacture of pickles, as a source of raw mango flavor for foods and therapeutic purposes. Also the bioactive properties of the compound have great potential and are worth exploring for pharmaceutical purposes **[15]**. In this study five different extracts of Ginger and mango ginger was tested against four pathogens (*Escherichia coli, Staphylococcus sp, Streptococcus sp, Pseudomonas sp*).

MATERIALS AND METHODS

Sample Collection

Ginger rhizomes (*Z. officinale*) and (*Curcuma amada* Roxb.) were obtained from the local market. The rhizomes were washed, sliced, dried at room temperature and powdered.

Collection of Microorganisms

The strains used in the present study were isolated from clinical samples and identified by morphological and biochemical characterization as per Bergye's manual of systematic Bacteriology.

The isolated pure cultures were maintained on Nutrient agar. The isolated organisms were found to be *E.coli, Pseudomonas sp., Staphylococcus sp. and Streptococcus sp.*

Solvent Extraction

About 10gms each of the ginger sample powder was mixed with 100ml of four different organic solvents (butanol, chloroform, ethanol, and methanol) at room temperature (27°C) on a rotary shaker at 100 rpm/min. The extracts were filtered and concentrated using a rotary evaoporater. The concentrated extracts were screened for antibacterial activity by the agar well diffusion method.

Determination of Antimicrobial Activity

In vitro antibacterial activity was determined by the agar well-diffusion method. The overnight grown bacterial culture was centrifuged at 6000 rpm for 5 min and the bacterial cells were re-suspended in saline. The bacterial suspension was transferred to a sterile Petri plate, mixed with molten Muller Hinton agar medium (Hi Media Laboratories Limited, Mumbai, India) and allowed to solidify. Wells of 6 mm were made into previously seeded MH agar plates. About 50 μl of the sample was placed in the wells and allowed to diffuse for 2 h. Plates were incubated at 37°C for 24 h and activity was determined by measuring the diameter of the inhibition zones.

Determination of Minimal Inhibitory Concentration

The extracts that exhibited considerable activity were used for MIC determination. The extracts of the test samples were tested in four dose levels of 10 µl, 20 µl, 30 µl and 40 µl. The overnight grown bacterial culture was transferred on MH agar plate and wells were punched out using a sterile 6 mm cork borer. Different concentration (10–40 µl) of the extract was placed in separate wells, allowed to diffuse for 2 h at 4^{o}C and then the plates were incubated at 37°C for 24 hrs. The zone of inhibition was observed and the lowest concentration of the test sample showing zone of inhibition was recorded as the MIC.

RESULTS AND DISCUSSION

Both the aqueous and organic solvent extracts of ginger and mango ginger showed antibacterial activity against *Escherichia coli, Streptococcus sp., Staphylococcus sp., and Pseudomonas sp*. The antibacterial activity of Ginger extracts was shown in **Figure 1**. The antibacterial activity of Mango Ginger extracts was shown in **Figure 2**. The Chloroform extract exhibited highest antibacterial activity compared to the other solvent and aqueous extract. In the present study maximum of 17 mm diameter of zone of inhibition was formed by chloroform extract of Mango *Ginger* against *staphylococcus sp.* All the extracts like butanol, chloroform, ethanol, and methanol showed antibacterial activity against wide range of bacteria. The variation in

antibacterial activity may be due to the method of extraction, solvent used in the The minimal inhibitory concentration was determined at different concentrations and varied for different solvent **(Table 1)**. The Chloroform extract of Mango *Ginger* was highly effective compared to other solvent extract. The results indicate significant capacity of *Ginger and Mango ginger* species for new bioactive compounds such as Antibacterial agent.

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extraction process and season at which samples were collected.

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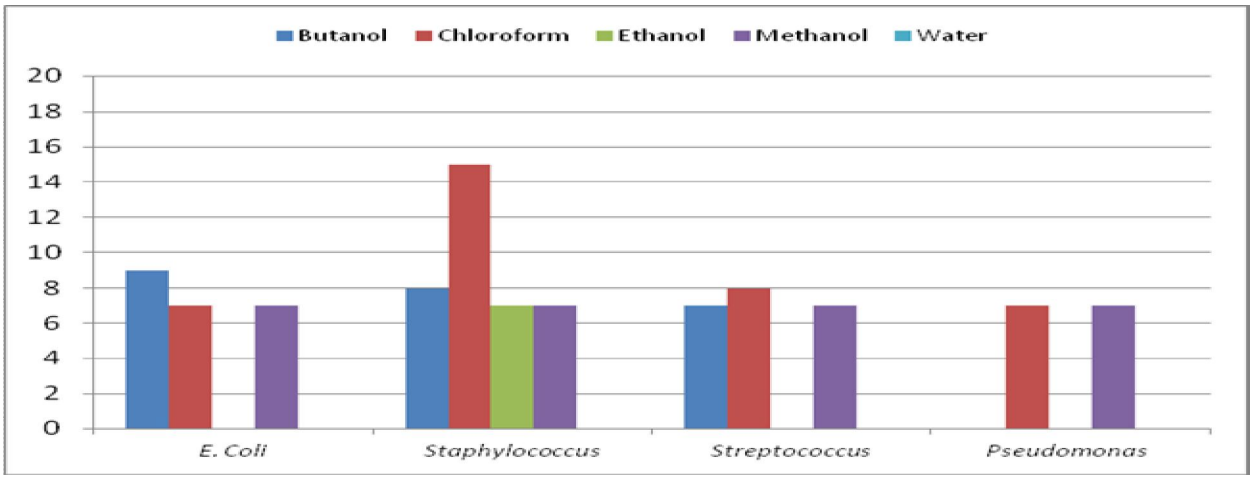

Figure 1: Antimicrobial Activity of *Z. officinale*

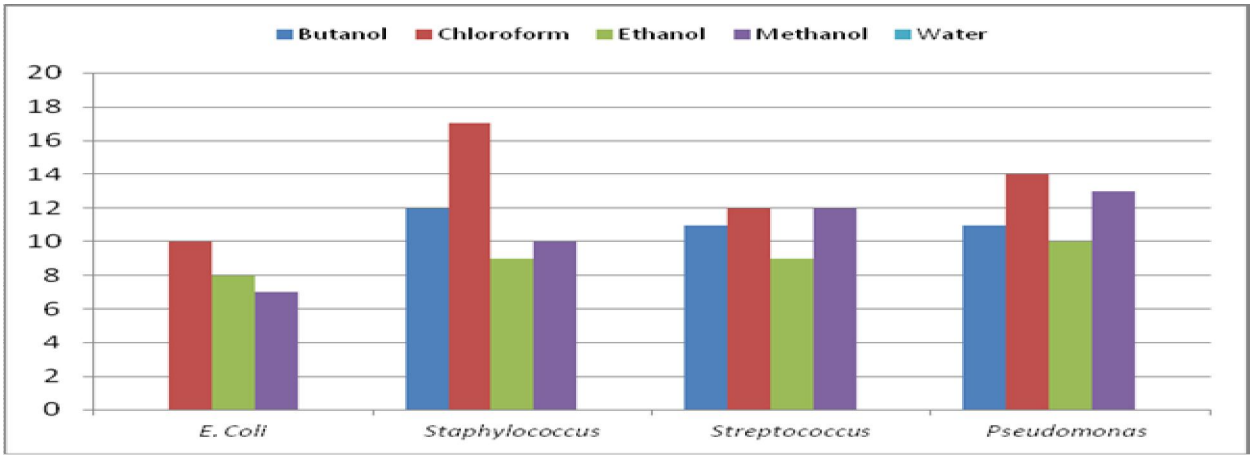

Figure 2: Antimicrobial Activity of *Curcuma amada* Roxb

Table 1: Minimal Inhibitory Concentration of *Ginger* Species

Plant Sample and Extraction Solvent	Minimum Inhibitory Concentration			
	Pathogen			
	E .coli	*Streptococcus*	*Staphylococcus*	*Pseudomonas*
Z. officinale				
Butanol	-	-	-	-
Chloroform	-	20	40	40
Ethanol	-	40	30	40
Methanol	-	30	20	40
Distilled Water	-	-	-	-
***Curcuma amada* Roxb**				
Butanol	-	40	40	40
Chloroform	-	20	10	20
Ethanol	-	-	-	-
Methanol	-	20	30	30
Distilled Water	-	-	-	-