

Original Research Article

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Evaluation Antibacterial Activity of three Most Consumed Tea Extracts against Pathogenic Bacteria

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ABSTRACT

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Green tea and black tea are derived from the plant *Camellia sinensis*, while lemon grass belong to *Andropogonschoenanthus* and herbal tea belong to different natural herbs plant. The present study was designed to evaluate the antimicrobial activity of different tea extract against most disease causing human pathogens which include *Escherichia.coli*, *Staphylococcus aureus*, *Salmonella typhi*, *Bacillus subtilis*, *Micrococcus luteus*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Klebseila pneumonia*, and *Citrobacterspps*. Antimicrobial components present in these tea extracts have high rate of antimicrobial properties. The antimicrobial activity of these extracts were determined by agar well diffusion technique. In this study black tea and green tea give maximum zone of inhibition against majority of pathogens as compare to lemon grass while on other hand herbal tea give no zone of inhibition.

Introduction

Tea is the type of beverage which belongs to *Camellia sinensis* plant (Fuller and Thomas, 2008). Tea is an infusion of leaves that has been consumed for centuries as a beverage and is valued for its medicinal properties. Green tea is non fermented tea originated in China whereas black tea has been the traditionally consumed tea (Graham, 1999). The fermentation process is the key between green tea and black tea. In case of black tea, the leaves and buds are dried before fermentation. While in green tea the leaves are first steamed and then dried. The

phytochemicals present in tea leaves are highly sensitive to oxidation process. Green tea contains 30 and 40 percent of water extractable polyphenols, while black tea contains between 3 to 10 percent. Black tea is also known to have potent antioxidant properties which are manifested by its ability to scavenge free radicals, that inhibit lipid, Epicperoxidation, and chelate metal ions. According to the previous studies, four polyphenolic compounds, Epigallocatechigallat (EGCG) natechingallate (ECG), Epigallocatechin

(EGC) and Epicatechin (EC) are significant antioxidants constituents present in tea. Among these EGCG is the most luxuriant component in tea extract and the most potent chemical tested for biological activity (EC). Black tea which is a major source of the aflavins and the arubigins has also been shown to have antibacterial properties both in vivo and in vitro. Lemon grass(*Cymbopogon Citratus*) belongs to the family Germinaceae. Lemon grass plant due to having alkaloids and phenolic components have also shown antibacterial properties (Stadtman, 1996).

The aim of this research was to evaluate the antimicrobial activity of most consumed tea extracts against pathogenic bacteria.

Materials and Methods

Collection of samples

Different tea leaves samples were purchased from the local markets of Karachi for screening the antibacterial activity against some selected gram negative and gram positive isolates.

Preparation of Hot Water Extracts

Green & Black Tea Extracts: 25 grams of tea sample were added in 250 ml of hot water. Stirred continuously for 3 times at 120 rpm for 1hr. Filtrate the mixture for extract collection.

Lemon Grass Tea Extract: 25 grams of lemon grass and make fine powder. 500ml of distilled water were added. Stirred continuously at 120rpm for 8 hours. Filter the extract.

Agar well Diffusion Technique

Lawn was prepared on MHA plates. Make four wells with a help of borer on each plate for each extract. Pour 100 µl of black tea, green tea, lemon grass and herbal tea extract in each well. Use Streptomycin as positive control. Incubate all plates at 37 °C for 24 hours. Observe the plates and measure zone of inhibition.

Results and Discussion

The results of the study showed that the leaves extract of *Camellia sinensis* indicates the presence of potent antibacterial activity, which confirms its use against microbial pathogens including antibiotic resistance bacteria.

Table.1 Antibacterial pattern of black tea

Organism	Black tea	Result	Positive control
<i>Escherichia coli</i>	25mm	sensitive	20mm
<i>K.pneumonia</i>	23mm	sensitive	25mm
<i>Bacillus subtilis</i>	22mm	sensitive	20mm
<i>M.lutes</i>	23mm	sensitive	30mm
<i>S.aureus</i>	9mm	sensitive	30mm
<i>S.typhi</i>	20mm	sensitive	20mm
<i>Ps.aeroginosa</i>	21mm	sensitive	23mm

Table.2 Antibacterial pattern of lemon grass

Organisms	Lemon Grass	Result	Positive Control
<i>Bacillus subtilis</i>	6mm	sensitive	10mm
<i>Proteus vulgaris</i>	No zone	resistant	10mm
<i>Klebsiella pneumonia</i>	6mm	sensitive	10mm
<i>Staphylococcus aureus</i>	6mm	sensitive	12mm
<i>Escherichia coli</i>	4mm	sensitive	5mm
<i>Pseudomonas aeruginosa</i>	8mm	sensitive	15mm

Table.3 Antibacterial pattern of green tea

ORGANISMS	GREEN TEA	RESULT	POSITIVE CONTROL
<i>Escherichia coli</i>	23mm	sensitive	20mm
<i>Klebsiella pneumonia</i>	4mm	sensitive	25mm
<i>Bacillus subtilis</i>	22mm	sensitive	20mm
<i>Micrococcus luteus</i>	25mm	sensitive	30mm
<i>Staphylococcus aureus</i>	20mm	sensitive	30mm
<i>Salmonella typhi</i>	20mm	sensitive	20mm
<i>Pseudomonas aeruginosa</i>	23mm	sensitive	23mm

The assessment of antimicrobial activity was evaluated by agar well diffusion technique in which Green tea gives high and effective zones of inhibition than black tea and herbal tea, Green tea>black tea >lemon grass>herbal tea. These observations may be attributed to green tea catechin compounds

and polyphenols. Polyphenols act directly against microorganisms by inhibiting virulence factors. These compounds have been found to possess antibacterial action which protect the body from damage caused by free radical-induced oxidative reactions. There are many health benefits that have

been reported to consumption of the tea beverage, including, reduction of cholesterol, antibacterial, anti-diabetic, anti-inflammatory and antiviral. It is hoped that by use of herbal tea it may help to avoid the side effects of antibiotics. In future, the combined use of tea and antibiotics could be also useful in fighting emerging drug-resistant problem especially among enteropathogens.

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