TO EVALUATE THE ANTI-MICROBIAL ACTIVITY OF GREEN TEA, BLACK TEA, COMMERCIAL TEA AND THEIR COMPARISION WITH MARKETTED ANTIBIOTIC, TETRACYCLIN

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ABSTRACT

The present study is to evaluate the anti–microbial activity of various types of methanolic extracts of tea like green tea, black tea and commercial tea and also to compare the same activity with standard drug like tetracycline. The method used to evaluate the anti-microbial activity is by observing the zone of inhibition against bacterial growth formed by the drug extracts over the culture medium on which bacteria are being grown intentionally prior to application of drug. Although methanol is itself an antimicrobial agent still the best extraction of purine alkaloids occurs with it only. So methanol was selected as solvent for extraction. And it was found that the tea extracts possess the anti-microbial activity alike the tetracyclines.

KEYWORDS

Thea sinensis, Anti-microbial activity, Green tea, Black tea, Commercial tea, Zone of inhibition and Tetracycline

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INTRODUCTION

Herbal medicines which formed the basis of health are throughout the world since the earlier days of mankind and are still widely used, with a considerable importance in international markets. The main objective of the study is to determine antimicrobial activity of methanolic extracts of green tea leaves, black tea and commercial tea against few bacterial and fungal pathogens of the plant "*Thea sinensis.*" The primary difference between green tea and black tea is in the fermentation process required to produce tea. In case of black tea the leaves and buds are fermented or oxidized after they have been dried [1]. In green tea the leaves are steamed after they are dried [2], where as the commercial tea is prepared in the industries and what we get from the market for household uses. The four polyphenol compounds, Epigallocatechin gallate (EGCG), Epicatechin gallate (ECG), Epigallocatechin (EGC) and Epicatechin (EC) are significant antioxidants constituents. Among these EGCG is the most luxuriant component in tea extract and the most potent chemical tested for biological activity . In the present experiment tea is selected because numerous studies show that tea leaves contain a high amount of polyphenols, which are a type of antioxidants and that regular consumption of 5 cups of tea per day contributes of them in high levels in blood streams.[4] Its antioxidants work to neutralize free radicals and tea leaves contain fluorides which strengthen bones and teeth and fight cavities.[5]

HISTORY

Chinese originally called it 'KIA' as far as is known it was during the course of 6th century AD that the name evolved 'CHA' on its arrival into west becomes 'Te' which is still the name for tea in many countries [5].

Discovery of tea

Legend has it that tea was discovered by the Chinese emperor, Shan Nong, in 2737 BC. The emperor had a habit of boiling his drinking water. One day while he was in garden few tea leaves fell by chance into his boiling water which gave off a rich alluring aroma. The emperor upon drinking this brew discovered it to be refreshing and energizing. He immediately gave the command that tea bushes to be planted in the garden of his place. Thus the custom of brewing fresh tea leaves in hot water began and it quickly spread. Since the discovery of tea known over the centuries the tradition of drinking tea brewed from fresh tea leaves in boiling water was been finally started in China. Until 5th century A.D. tea was primarily used as remedy due to medicinal benefits attributed to it's from this time onwards. Chinaese upper class adopts the fashion of presenting packages of tea as highly esteemed gift and of enjoying drinking tea at social event and in private homes. At around same time Chinese ceremony began and develop and the tiding of tea began to spread as it reached to Japan.

PHARMACOLOGY OF TEA

The first documented report of an antibacterial action of tea was made in 1906, when McNaught, a British Army surgeon, showed that tea killed the causal organisms of typhoid fever *(Salmonella typhi)* and brucellosis *(Brucella melitensis)* [6]. However, no further work was done on this phenomenon for the next 50 years. Now it is known that tea has a very broad spectrum of antimicrobial action: viruses, bacteria, yeasts, fungi and various parasites have been reported. Tea leaves consist mostly of cellulose, a water-insoluble polymer of glucose, which is a simple sugar (a monosaccharide). Cellulose performs a function in plants similar to that of fibrous proteins in animals: it is structure building material.

Tea is a beverage widely appreciated and consumed in vast quantities worldwide. The amino butyric acid (GABA) tea is a kind of special tea enriched with GABA. The amount of GABA was accumulated by the repeating treatments of alternative anaerobic and aerobic conditions. GABA could act effectively as a natural relaxant to induce relaxation and diminish anxiety, and its administration could concurrently enhance immunity under stress conditions . Furthermore, GABA has a physiological role in many systems outside the central system, such as the regulation of cardiovascular functions, the inhibition of metastasis of cancer cells, and the modulation of renal function. Kanehira et al. suggested that intake of GABA-containing beverages, especially those containing 50 mg of GABA, might help reduce both psychological and physical fatigue and improve task-solving ability [7]. Tetracycline is also an antibiotic having anti-microbial activity available in the market which is used in the present experiment as a standard drug which inhibit the protein synthesis by binding to 30s ribosomes in susceptible organism that leads to the failure of complex formation by attachment of aminoacyl-t-RNA to mRNA ribosome complex and finally that results in failure of peptide chain formation [4].

PHYTOCHEMICAL SCREENING TEST

Green tea is non-fermented tea. The tea is an infusion of leaves that has been consumed for centuries as a beverage and is valued for its medicinal properties. The phytochemical screening of tea revealed the presence of alkaloids, saponins, tannins, catechin and polyphenols. Tea leaves are known for its antimicrobial activity against many microorganisms. The primary difference between green tea and black tea is in the fermentation process required to produce tea. In case of black tea the leaves and buds are fermented or oxidized after they have been dried. In green tea the leaves are steamed after they are dried. According to the previous studies, four polyphenol compounds, Epigallocatechin gallate (EGCG), Epicatechin gallate (ECG), Epigallocatechin (EGC) and Epicatechin (EC) are significant antioxidants constituents. Among these EGCG is the most luxuriant component in tea extract and the most potent chemical tested for biological activity. These polyphenols may account for as much as 30% of the dry weight of fresh tea leaves. Some of the antibiotics have side effects. The synergistic antimicrobial activity of tea and antibiotics against enteropathogens are effective [8].

The combined use of tea and antibiotics could be useful in fighting emerging drug-resistance problem especially among enteropathogens. Tea is cultivated in many countries of the world. India is largest tea (black tea) producer in

world followed by Japan (green tea) and China. In the present study *Camellia assamica* (Green tea) leaves extracts were tested for antibacterial activity against various bacteria isolated from Green tea is a non-fermented tea. The tea is an infusion of flavorful leaves that has been consumed for centuries as a beverage and is valued for its medicinal properties [9].

MATERIALS AND METHODS

Plant material.

The fresh leaves of the plant *Thea sinensis Linne,* locally known as "Sha paat" was collected from the place called Sonapur, Assam.

The collected plants were authenticated by Curator and research guide, department of Botany, Gauhati University .

Preparation of the Extracts.

In this process, the crude drug was powdered first then sieved and then placed the drug with whole of the menstrum, methanol in a closed vessel for 7 days. During this period shaking is done occasional. After 7 days, the liquid is strained and marc is pressed. The expressed liquid is mixed with strained liquid. It is then filtered to make clear liquid. The final volume is not adjusted. Then the extracts were concentrated to dryness using rotary evaporator [10]

Zone of inhibition studies of extracts

Nutrient agar media was prepared, poured into sterile petridish and allowed to solidify, Cotton swab was taken into sterile and dipped into a culture or cell suspension of S.aureus. Cotton swab was spread on the entire agar surface of each plate. To ensures the uniform distribution of organism over the solidifying agar surface. Then aseptically, the agar surface was allowed to dry for 5 min [11] . Picked up a sterile filter paper disc by the outer edge using flamed, sterile forceps and dip the paper disc into different concentration of tea extract solution and tetracycline 1:10, 1:100 and 1:1000. Placed the dis-impregnated with antibiotics and extract solution on the surface of Microorganism seed agar plate and was pressed gently with sterile forceps to ensure firm contact with agar surface. All the plates were incubated at 37 degree C for 48 hrs in an inverted position. Then after 48 hours all the plate was examined for zone of inhibition in millimeters using the rules on undersize of the plate Micro organism seed agar plate [12]. . Methanol was individually observed for anti-microbial activity and it showed lesser zone of inhibition in comparison with methanolic extract of tea. These proves that tea has anti-microbial activity.

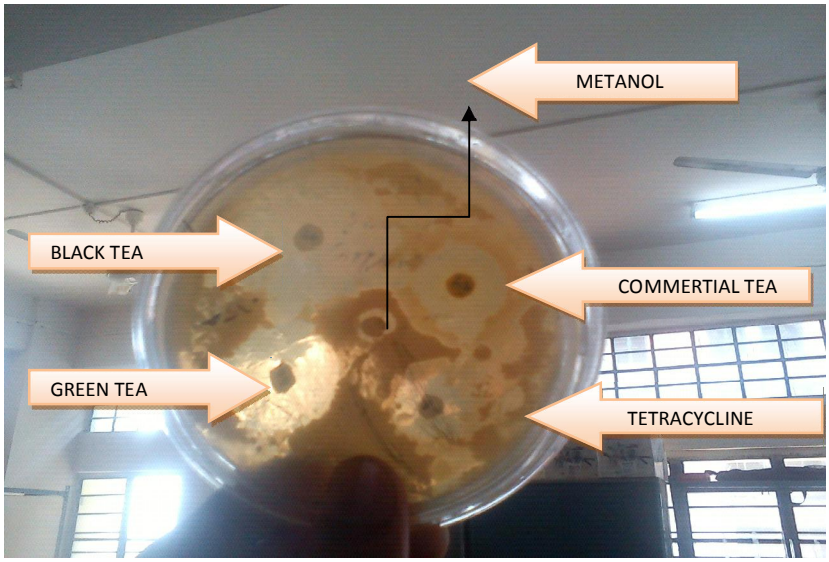

Fig. I: PICTURE FOR ZONE OF INHIBITION

OBSERVATIONS

EXTRACTS	E.coli(-ve)		S.aureus(+ve)
GREEN TEA	1:10	7 mm	10 mm
	1:100	9 mm	6mm
	1:1000	3 mm	4 mm
BLACK TEA	1:10	9mm	7.5mm
	1:100	6mm	4mm
	1:1000	4 mm	1mm
COMMERCIAL TEA	1:10	2mm	4mm
	1:100	1mm	2mm
	1:1000	1mm	1mm
STANDARD TETRACYCLIN	1:10	8 mm	10mm
	1:100	8 mm	8mm
	1:1000	6 mm	3.5mm

RESULTS

The methanolic extracts of tea was screened for antimicrobial activity (E.coli and S.aureus) against the standard drug tetracycline. The test compounds showed the zone of inhibition of 2mm, 4 mm, 8mm, 6mm, 9mm etc in three various dilute concentration of 1:10, 1:100 and 1:1000.

CONCLUSION

The extract of green tea showed more potency against gram positive (*S.aureus*) followed by black tea and commercial tea, whereas black tea showed more potency against gram negative (*E.coli*) followed by green tea and commercially available tea. So it can be concluded that green tea, black tea & commercial tea has got antibiotic property. Tetracycline also shows anti-microbial but also shows some adverse effects nausea, vomiting, liver damage etc so using TEA can be beneficial as a safety against bacteria without side effects.

CONFLICT OF INTEREST STATEMENT:

The author declares that there are no conflicts of interest.

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