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Comparative Analysis of Antimicrobial Activity of Black Tea,Green Tea and White Tea Extracts on Streptococcus Mutans by Tube Dilution Method

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Abstract

Aim : To compare the antimicrobial effect of black tea , green tea , white tea on Streptococcus mutans by tube dilution methods.

Background: Medicinal plants have been a major source of therapeutic agents and cure diseases. In the present investigation comparative analysis of the potential antibacterial activity of aqueous extracts of white tea , black tea, green tea which were obtained by infusion of leaves. It was performed by using minimal inhibitory concentration and minimal bactericidal concentration against bacteria as Streptococcus mutans which is the potent initiator and leading cause of dental caries of world wide. Black tea is generally stronger in flavor than the less oxidized teas. Green tea is non-fermented tea which is valued for its medicinal properties. White tea contains the most antioxidants and also contains the poly phenols, phyto nutrients.

Materials And Methods: In this experimental study black tea, green tea and white tea were used on the organism Streptococcus mutans to compare the antimicrobial effect by minimal inhibitory concentration and minimal bactericidal concentration.

Reason: The extracts of black tea, green tea and white tea are found to hane unique antimicrobial properties. They are find to have more effectiveness on treating caries caused by S.mutans.

INTRODUCTION

Tea leaves are known for its antibacterial activity against any micro organisms. It is one of the most popular beverages worldwide. Black, Green and White teas are extracted from the leaves of Camellia sinensis[1].Currently, a growing consumption of tea is observed in western countries, where it has been considered as functional food. The biological properties of tea include effects on the Central System (CNS) and antioxidant effects, attributed to the presence of methylxanthines, such as caffeine and phenolic compounds, especially catechins [2].

Black tea is more oxidised than all other types of teas. It contains antioxidants and other substances that might help protect the heart and blood vessels [3].It is also used for treating headache and low blood pressure; preventing heart disease, including “hardening of the arteries” (atherosclerosis) and heart attack [4].

Green tea have undergone minimal oxidation during process. It is able to maintain important molecules called polyphenols, which seem to be responsible for many of the benefits of green tea [5]. Polyphenols might be able to prevent inflammation and swelling, protect cartilage between the bones, and lessen joint degeneration. They also seem to be able to fight human papilloma virus (HPV) infections[6].

White tea is made from buds and young leaves, which are steamed or fired to inactivate polyphenol oxidase, and then dried [7]. It is a natural killer of bacteria and viruses. It contains the most antioxidants which are protect the body from damage by free radicals that will damaging DNA and accelerating aging [8]. White tea may have profound power against cancer-causing cells .Flavonoids, a class of antioxidants, inhibit the growth of cancer cells and prevent the development of new ones [9]. Catechins, another group of antioxidants, have been found to reduce cholesterol, and white tea is teeming with them [10].

MATERIALS AND METHODS

In this in vitro study, isolated colonies of Streptococcus mutans was prepared for an antimicrobial screening test. The tube dilution method was used for determining the minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC).

The minimum inhibitory concentration (MIC) was used to evaluate the inhibitory effects of the three tea extracts. Ten sterile test tubes were collected and 1 mL of sterile tryptic soy broth was added to each tube [11]. Next, 1 ml of various dilutions of extracts [1000µl to 1.9µl] was added to all the test tubes. A bacterial suspension of 1.5x108 cfu equal to No. 0.5 McFarland standard was prepared from streptococcus mutans[12].

After the bacterial suspension was added to the test tubes, the tubes were placed in a incubator and were incubated at 37°C for 24 - 48 hours. After this period was elapsed, the tubes were examined for the presence of turbidity, which indicates microbial growth [13]. The last tube or the last dilution of extract at which turbidity was not observed, was considered as the MIC. After 24 hours of incubation, the tubes without turbidity (transparent), which indicated the inhibition of bacterial growth by the respective extract, were transferred to a solid medium (Blood agar) and were evaluated in terms of microbial growth to determine the MBC of three tea extracts [14]. The last tube, which was negative in terms of culture on solid medium, indicated the minimum bactericidal concentration (MBC) of the three tea extracts [15].

RESULT AND DISCUSSION

The tea extracts stopped the growth of tested microorganism, and had bactericidal effects. The MICs of black tea,green tea and white tea extracts for Streptococcus mutans were 31.25, 62.5 and 62.5(µg/ml) respectively (Table 1). The MBCs of black tea , green tea and white tea for Streptococcus mutans were 15.62, 62.5 and 31.25(µg/ml). The result shows that the extract of black tea has got highest antimicrobial activity when compared to the activity of green and white tea extracts.

Table 1: Minimum Inhibitory Concentration and Minimum Bactericidal Concentration (µg/ml) of black tea,green tea and white tea extracts.

TEA NAME	MIC(µg/ml)	MBC(µg/ml)
White tea	62.5	31.25
Green tea	62.5	62.5
Black tea	31.25	15.62

CONCLUSION

The present comparative study of black tea , green tea and white tea extracts demonstrated that the extract of black tea has found to be more antimicrobial activity on Streptococcus mutans than the green and white tea extracts by tube dilution method.

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