International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 06 | June - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

GREEN TEA: A BOON FOR ORAL HEALTH

Dr. Saumya Nandan, Dr. Nidhi Pruthi Shukla, Dr. Rohma Yusuf, Dr. Surbhit Singh, Dr. Raman Jayant, Dr. Smriti Tripathi

ABSTRACT: - Green tea includes a number of bioactive compounds that have anti-oxidant, anti-inflammatory, and anti-microbial activities, among other things. It is said to play a role in oral health by preventing dental erosion, caries, alveolar bone resorption, and oral malodour, among other things. Green tea is a good source of antioxidant polyphenols. The most interesting components in green tea leaves are polyphenols, such as epigallocatechin 3 gallate (EGCG). A increasing body of evidence suggests that green tea and its polyphenols are good to dental health. Green tea protects against bacterial-induced dental cavities, and tea polyphenols have antiviral characteristics that are thought to aid in influenza virus prevention.

Keywords: Green Tea Extract Polyphenol E; Oral Health; Antimicrobial, caries, periodontitis.

INTRODUCTION

Green tea has been consumed by people worldwide for over 4000 years. Camellia sinensis tree leaves are used to make Green tea, which grows in Southeast Asia.1 It began in China and has since spread worldwide due to monetary factors and technological advancements.

Green tea has various health-promoting bioactive chemicals used in traditional Chinese medicine for millennia. It's a functional food because it offers more health benefits than just nutritional ones. Antioxidant, anti-inflammatory, antibacterial, and anti-mutagenic activities are all present.2

Green tea has several health benefits, including cancer prevention, antimicrobial, antioxidant, and cholesterol-lowering properties. Green tea's antioxidant qualities protect DNA from oxidative damage. Green tea's properties aid in the maintenance of oral health and improvement.3,4

Green tea is made by macerating and drying the leaves of the tea plant. It's made from unfermented leaves and contains polyphenols,5 a powerful cancer-prevention agent with high convergence. Several epidemiologic and experimental findings have established the existence of a strong link. There is a link

between green tea drinking and the prevention of cardiovascular disease and cancer.6 The most common polyphenol found in green tea, epigallocatechin gallate, is thought to be responsible for these benefits. Epigallocatechin gallate has been shown to cause apoptosis in various tumour cells, but it has little or no effect on normal cells.7,8 It was recently discovered that epigallocatechin gallate can cause osteoclasts to die by apoptosis.9 Thus, it can prevent alveolar bone resorption by inhibiting osteoclast survival through caspase-mediated apoptosis and can benefit periodontal health.

Green tea benefits oral conditions such as dental caries, periodontal diseases and halitosis. Green tea helps reduce bacterial activity in the oral cavity, which, in turn, it reduces the aforementioned oral afflictions. Furthermore, the antioxidant effect reduces the chances of oral cancer.10

According to an estimate, the daily consumption is more than 3 billion cups, almost 75 per cent of consumption by China.11 The standard method defined in Chinese culture is illustrated in Fig. (1). Tea leaves are available in various forms depending on processing techniques illustrated in Fig. (2) 12 Dissimilarity between green and black tea is due to processing methods adopted during manufacturing. Due to the fermentation of black tea, chemical substances Green tea contains polyphenols known as catechins, which are oxidised and condensed polyphenols with molecular weights less than 450Da. Oolong tea, a third variety of tea, comprises, a mixture of monomeric and oligomeric catechins and is semi-fermented.

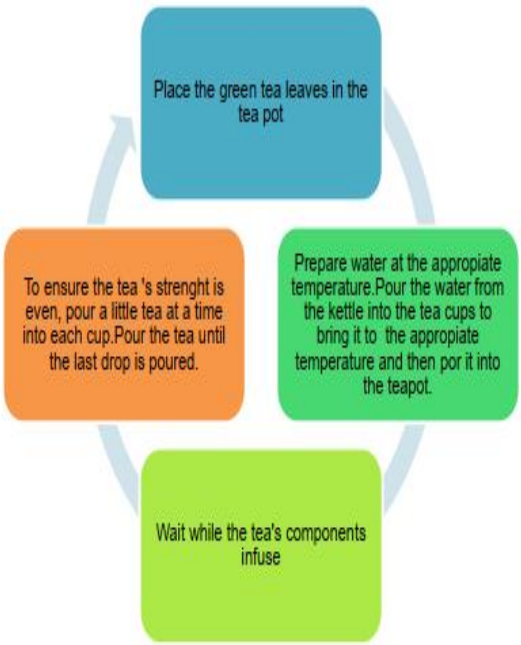

Fig. (1). Standard method to make green tea in chinese history.

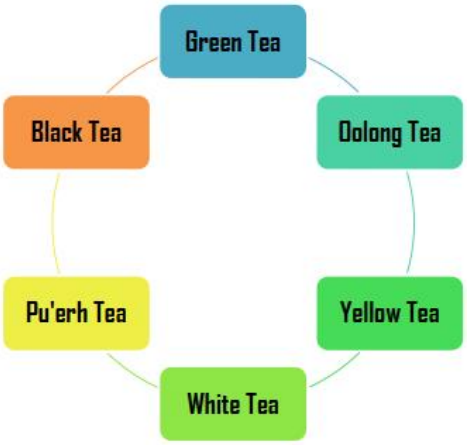

Fig. (2). Different kinds of tea according to their processing.

ORIGIN

The Tibetan plateau in western China and northern India is where tea is supposed to have first appeared. According to legend, the Chinese monarch "Shen Nung" discovered tea when leaves from a wild tea bush fell into a pot of boiling water in 2737 BC. The word "t'e," pronounced "tay," comes from a Chinese Amoy dialect word that has evolved into beautiful art. In Chinese, the word "cha" now signifies "tea." This word was sometimes changed to "chai" when it travelled westward into Middle Eastern languages. 13

In India, the Buddhist monk Siddhartha is credited with discovering tea in the sixth century. He picked and chewed the leaves of a neighbouring tree, inspired by supernatural intervention. He collected and chewed the leaves of a nearby tree, noticing an increased sense of alertness and well-being to his delight. Camellia Sinensis, of course, was the tree whose health-giving virtues enabled him to maintain his commitment.

COMPOSITION

Green tea's chemical composition could be more complex and characterized. Polyphenols, particularly flavonoids like catechins, catechin gallates, and proanthocyanins, are the most prevalent components in green tea. In addition to the unique amino acid theanine (4 per cent), the fresh leaves contain caffeine (approximately 3.5 per cent of total dry weight, or about 50 mg/cup when brewed), theobromine (0.15–0.2 per cent), theophylline (0.02–0.04 per cent) and other methylxanthines, lignin (6.5 per cent), organic acids (1.5 per cent), chlorophyll (0.5 per cent), and free amino acids (1–5.5 per cent), lignin (6.5 percent14

The chemical composition of green tea consists of: -[15]

1) Proteins

2) Enzymes

3) Amino acids

4) Carbohydrates

5) Minerals and trace elements

6) Trace amounts – lipids, pigments, steroids, vitamins and volatile compounds.

7) Fresh tea leaves contain alkaloids and catechins.

CLASSIFICATION OF GREEN TEA PLANT.[16]

Kingdom	**Plantae**
Subkingdom	Tracheobionta
Super-division	Spermatophyte
Division	Magnoliophyta
Class	Magnoliopsida
Sub-class	Dillenidea
Order	Theales
Family	Theaceae
Genus	*Camellia L.*
Species	*Camellia Sinensis*

MECHANISM OF ACTION

The endoplasmic reticulum and mitochondria release oxygen. This oxygen is oxidized to hydrogen peroxide, releasing reactive oxygen species molecules. These reactive oxygen species molecules can damage DNA and RNA, corrode proteins (enzymes, histones), oxidize lipids, and even trigger cell death. By suppressing the function of the reactive oxygen species molecule, green tea can prevent all of these degenerative effects.

The flavan-3-ol coupled to gallic acid, which gives this ability, has been found to scavenge nitric oxide and superoxides in green tea extract and tannin combinations.17 Several in vitro investigations have looked into the impact of green tea catechins on copper-induced oxidation of low-density lipoprotein (LDL).18-20 Catechin action in green tea The sequence of catechins that protect LDL from copper-induced oxidation is EGCG=ECG>EC=C>EGC. 21 Green tea catechins have also been demonstrated to increase lag time, block the synthesis of oxidized cholesterol, and lower linoleic and arachidonic acid levels. 22

In studies, green tea catechins have also been shown to lower LDL oxidation, the development of thiobarbituric acid reactive substances (TBARS), cellular oxidation, and superoxide production. Green tea catechins have been demonstrated to reduce TBARS and glutathione disulfide production and alpha-tocopherol depletion in human hepatoma cells while increasing glutathione content. 24 Green tea catechins have been shown to inhibit protein tyrosine kinase activity, reduce c-jun mRNA expression, and inhibit JNK1

activation, besides having antioxidant properties.25 This could be due to inhibiting protein tyrosine kinase activity, reducing c-jun mRNA expression, and inhibiting JNK1 activation. 26 Green tea polyphenols also suppress p44/42 MAP kinase expression27 and cause smooth muscle cell death in a p53 and NF-kappaB-dependent manner. 28 Vascular smooth muscle cell (VSMC) proliferation enhanced by advanced glycation end products or native LDL dose was dependently inhibited by green tea polyphenols.29,30 Green tea catechins reduced thymidine incorporation in VSMC activated with platelet-derived growth factor-BB and Ang II. 31,32 Catechins suppress Ang II-stimulated VSMC proliferation by inhibiting Ang II-stimulated MAP kinase and activator protein-1 signalling pathways. EGCG was found to have anti-invasive and anti-metalloproteinase properties in aortic smooth muscle cells.34

Green Tea Oral Health Benefits[35]

Gum Health - Flavonoids, which can be discovered in green tea, are anti-inflammatory. The gums become inflamed in gingivitis. and the first stage of gum disease, can be reduced by drinking green tea regularly. Acne, skin problems including psoriasis and dandruff, arthritis, and other inflammation-related issues have all been linked to green tea.

Reduce Risk of Cancers - Cancer development is linked to oxidative stress and damage, and numerous studies have found that frequent consumers of green tea (a great source of antioxidants) are considerably less likely to acquire a variety of cancers, including oral cancer. Green tea extract was administered to patients with precancerous lesions in their mouths in a University of Texas trial, and it was found to prevent the progression of oral cancer. Regular green tea consumption has also been associated with a lower risk of significant health conditions and diseases, such as stroke and type 2 diabetes.16 Green tea prevents malignant growth by inhibiting angiogenesis and blood flow to the tumour. Green tea-induced apoptosis promotes modified cell death while promoting average cell growth.36

Caries:- Both in vivo and in vitro research have revealed that green tea extract inhibits caries in hamsters and improves acid resistance in human dental enamel.37 The Fluoride was almost eliminated from the dialyzed tea solution, which had similar benefits to the original tea extract. The findings of this study revealed that Fluoride in green tea and other tea components might have a role in boosting cariostatic action. On the other hand, Fluoride's action appears irrelevant because its concentration is so low. Green tea's effect on caries inhibition and increased acid resistance appear more correlative with the tea's nondialyzable components.38

Periodontal implication: - Several writers have looked into the inhibitory effects of catechin in green tea on periodontal pathogens, which could explain why drinking green tea is good for periodontal health. P.

gingivalis, Prevotella intermedia, and Prevotella nigrescens growth and adhesion to human buccal epithelial cells are inhibited by green tea catechin.39

Halitosis: - Halitosis is caused chiefly by volatile sulphur compounds (VSCs) generated in the oral cavity, such as H S and CH SH. Oral bacteria degrade proteinaceous substrates to cysteine and methionine, which are then transformed into VSCs. Researchers evaluated whether green tea powder decreased VSCs in mouth air and compared its effectiveness to that of other meals that are claimed to manage halitosis because tea polyphenols have been demonstrated to have antibacterial and deodorant benefits. Green tea showed the most significant drop in concentrations of both H S and CH SH gases immediately after administration; notably, CH SH, which also had a greater connection with odour strength than H S; however, no reduction was seen at 1, 2, or 3 hours following administration and in the event of an in vitro investigation, toothpaste, mints, and green tea significantly reduced the generation of VSCs in a saliva-putrefaction system, whereas chewing gum and a parsley-seed oil product had no effect. Mints, chewing gum, and a parsley-seed oil product all had significant deodorant action, whereas mints, chewing gum, and a parsley-seed oil product did not. As a result of its antibacterial and deodorant properties, green tea was found to be particularly successful in temporarily lowering mouth malodour, whilst other foods were not.40

Antioxidant:- Green tea helps to strengthen cells. They save cells from the harmful effects of peroxyl, hydroxyl, and peroxynitrite radicals. Inconsistencies in cell reinforcements and oxygen species cause cell damage. Green tea polyphenols are divided into six catechin groups.

Green tea reduces the risk of coronary vascular disease by lowering low-density lipoprotein oxidation. It also has a low rate of malignant development.41

DOSAGE

The most common form of green tea is dried-leaf tea. Drinking freshly brewed tea is an excellent way to get catechins and other flavonoids. Three to four cups of tea every day is the suggested amount. Green tea contains roughly 50–150 mg of polyphenols in a typical cup.42 According to some research, up to 10 cups of tea per day are required to acquire enough polyphenols to detect a significant health improvement. In one study, the author measured daily green tea consumption in cups and discovered that every one cup/day increase in green tea consumption was linked with a 0.023-mm drop in mean PD (P0.05), a 0.028-mm decrease in mean CAL (P0.05), and a 0.63 per cent decrease in mean PD in the BOP (P<0.05).43

TIPS FOR PREPARING

Like fresh green leafy vegetables, green tea should be handled with care. For brewing tea, spring water is best, followed by filtered water. Distilled water should never be used; the brew will be flat due to the minerals removed, which are necessary for bringing out the tea's flavour. If brewing tea in a small teapot, use 3 g of tea to 5 ounces of water; for other methods, use 4 g of tea to 8 ounces of water. Although black and oolong teas require boiling water to brew, green tea requires significantly cooler temperatures (160–170°F; 79–85°C) and should be steeped for three minutes. Allow the water to just come to a boil to unleash its oxygen, then set it aside.44

DISCUSSION

Green tea is one of the most used beverages in the world, and it has gotten a lot of attention due to its numerous scientifically established health benefits. Green tea has two beneficial components, catechins and the amino acid L-theanine, which reduce the caffeine's effect. Green tea's caffeine mixes with catechins in the water during brewing, lowering the caffeine's activity compared to coffee or cocoa. L-theanine, which is exclusively present in tea plants and some mushrooms, also enhances the creation of alpha brain waves, which soothes the body and promotes a peaceful state of awareness.13

This study looks at the relationship between tea consumption and tooth health. Green tea is beneficial to oral health in a variety of ways. It has anti-inflammatory qualities, lowers cancer risk, and so on. Green tea's antioxidants have significant bacteria-killing properties, and they can help prevent bad breath by inhibiting anaerobic bacteria, reducing the creation of volatile sulphur compounds, and lowering saliva acidity and dental plaque.

Gingivitis and periodontitis are the two most common types of mouth inflammation. Green tea catechin has been shown to protect against the onset of oxidative stress, and this action has been linked to catechin's anti-oxidative mechanism. The pathogenesis of periodontal disease and many other diseases is related to oxidative stress, and antioxidants are thought to protect against inflammatory diseases.15

Further studies are warranted for a better understanding of how green tea works, particularly at the cellular level.

CONCLUSION:

This study investigates the link between green tea drinking and dental health. Green tea is a reasonably simple habit to maintain oral health by drinking it at meals and during breaks.

Green tea aids the body's inflammatory response to periodontal microscopic organisms, suggesting that it could assist in promoting periodontal health and prevent future disease. Green tea catechin use daily may be a practical and cost-effective technique for preventing periodontal disease, but it should be done cautiously to avoid adverse responses. Let's start tasting green tea and see how we might improve.

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