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# Tea and Wellbeing

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Undoubtedly, tea made out of tender leaves of Camellia sinensis is one of the most widely consumed beverages next to water worldwide today. It is a picture-perfect image of serenity: relaxing with a good book, sipping a cup of hot tea. For thousands of years, the harvesting, processing, and packaging of Camellia sinensis leaves, known worldwide as tea, have developed as an integral part of society and culture. Tea also has an ancient and intriguing history. History reveals that Chinese mythology teaches that in the year 2737 BC the Emperor Shen Nung discovered tea drinking while on an outing to the countryside. The Emperor, having noted the fragrant smell of tea when leaves from branches used to fuel his fire fell into a kettle of boiling water, had a brew of the leaves prepared, and the merits of tea drinking were found. The Chinese have historically used tea as a beverage valued for its pleasant flavor and medicinal qualities as well.

Today, tea is valued for its taste, aroma, health benefits, and cultural practices. It is one of the safest beverages since it is made with boiling, sterile water and it is widely considered to promote feelings of calming and soothing. Black, oolong, green, and specialty teas all originate from the same plant but owe their unique taste and appearance to differences in processing. It is estimated that about 78% of world production of tea accounts for black tea, 20% for green tea, and only 2% for other tea types. Black tea is consumed all over the world, whereas green and oolong tea, previously peculiar to Asia, are also now gaining popularity in Europe and North America. The global tea market is considered one of the most rapidly growing at present, and with the rise of global interest and recognition, ample products are designed around tea.

Teas such as oolong, black, white tea, and green teas (see Figure 1) have shown a great demand among the consumers nowadays. These types of tea are classified based on the preparation and the degree of oxidation throughout the processing of tea leaves. Enzymatic oxidation of tea polyphenols by the polyphenol oxidase during the oxidation period formed the two major compounds, orange-red theaflavins (TFs) and the dark brown thearubigins (TRs), which are the primary oxidation products of catechins in black tea. The theaflavins are exclusively dimeric compounds, and the thearubigins are made up predominantly of polymeric compounds; some dimeric units may also be present.

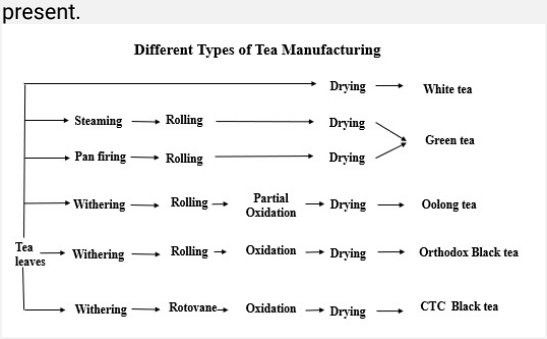


Figure 1: Different types of tea manufacturing

Tea is not only a safe beverage in terms of calories and sodium but also has additional benefits like containing uniquely high biologically active components. Tea is valued for its rich flavors and numerous health-promoting effects, which are mainly attributed to biologically active compounds including polyphenols (flavonols, catechins, anthocyanins), caffeine, γ-Aminobutyric acid, polysaccharides, gamma aminobutyric acid, L-theanine, and aroma compounds. Chemical compounds present in tea has enabled a plethora of vital physiological properties and health benefits. Though tea consumption has been linked to health benefits from the beginning of its history, its scientific investigation is being carried out. However, during the past few years, there has been a surge in comprehensive scientific studies on tea and its biologically active constituents, with a particular focus on its health benefits. Tea polyphenols primarily consist of flavanols, along with flavones, phenolic acids, depsides, and flavonols and flavonol glycosides.

The most predominant polyphenols present in raw tea leaves are catechins. Tea is an excellent source of dietary polyphenols, which are known for their strong antioxidant and anti-inflammatory properties, suggesting it may help in the prevention or management of various chronic diseases. Epidemiological studies have revealed that consumption of tea is useful to improve the mood, reduce stress, and minimize symptoms of depression. There is evidence that white, green, oolong, and black teas have an effect on cognitive functions, and they consist of several neuroactive compounds. Interestingly, tea may have a positive impact on individuals engaged in creative work by enhancing cognitive function and supporting clearer thinking. Furthermore, tea drinking is famous for reducing the feeling of tiredness and boosting the mood of people.

Although there is a wealth of evidence supporting the positive health effects of green tea, research studies are scares on more widely consumed black tea. Several studies have indicated that regular consumption of black tea could contribute to a reduced risk of coronary heart disease, stroke, and cancer. Moreover, it exhibits anti-inflammatory, antimicrobial, anti-obesity, and anti-hyperglycemic activities while providing protection from dental caries and bone loss. The most consistent research data suggested that drinking more than three cups of black tea daily may potentially reduce the risk of myocardial infarction. Also, it is considered safe to have an ideal intake of tea that lies between 3 and 8 cups daily. Most of the epidemiological studies indicated that the intake of flavonoids from black tea is correlated with a reduction in mortality rate related to coronary heart disease. Several in vitro experiments indicated the capacity of black tea polyphenols in preventing the progression of atherosclerosis by preventing the oxidation of low-density lipoproteins. Besides, black teas are considered to have pharmacological potential for treating obesity. Furthermore, recent studies have revealed the possible binding sites present on SARS-CoV-2 and constituents of black tea including theaflavins.

Green tea is produced with minimal processing of freshly plucked tea leaves and buds, allowing it to retain a high concentration of antioxidants, primarily tea polyphenols. These compounds contribute to green tea's wide-ranging health benefits. Notably, green tea has shown promise in alleviating endometriosis through multiple mechanisms, including anti-fibrotic, anti-angiogenic, pro-apoptotic, and anti-proliferative actions. It also helps reduce cyst formation and supports ovulation by lowering plasma corticosterone levels, alleviating generalized hyperalgesia, and easing uterine contractions, the main cause of menstrual pain.

The therapeutic properties of green tea are extensive. It exhibits anti-stress, antioxidant, anti-arthritic, anti-inflammatory, cholesterol-lowering, lipid-lowering, antidiabetic, liver-protective, antimicrobial, anticancer, antiparasitic, antimutagenic, and skin- and collagen-protective activities. Furthermore, green tea supports cognitive and neurological health through its memory-enhancing, antidepressant, neuroprotective, and anti-neurodegenerative effects. It also plays a role in strengthening bones and preventing skin aging. Numerous epidemiological and clinical studies have confirmed the protective effects of green tea supplementation against various chronic diseases.

White tea is a non-oxidized tea manufactured from the buds of the plant. Several health benefits associated with white tea consumption include a lower risk of hypertension and cardiovascular diseases, control of body weight, promotion of oral health, antimicrobial activity, protection against UV radiation, increase of bone mineral density, and antifibrotic and neuroprotective properties. Other than these, it is reported that white teas have beneficial biological effects against a number of chronic illnesses, including cancer, metabolic syndrome, type 2 diabetes, and neurodegenerative pathologies. It has been proven that the hypocholesterolemic potential of white tea is higher than that of either green or black tea. Hence, white tea is extremely popular for having beneficial compounds in controlling body weight.

**Tea biomolecules**

Based on the fact that tea has been consumed safely for centuries, the compounds in tea are safe and help the well-being of its consumers. Therefore, tea is considered a promising source for novel drug discovery and synthesis. The antioxidant properties of tea polyphenols play a central role in many disease prevention strategies, largely due to their ability to stimulate the production of endogenous antioxidant enzymes. As such, tea polyphenols are considered key contributors for the overall health and disease prevention. They have been shown to enhance lipid metabolism, reduce insulin resistance, and aid in the management of non-alcoholic fatty liver disease. Moreover, tea polyphenols can positively influence the gut microbiota by creating a favorable environment for beneficial bacteria, which helps reduce both inflammation and oxidative stress. Tea polyphenols can regulate chronic metabolic disorders by providing systematic protection to host metabolism by regulating several behaviors and physiological processes. Furthermore, researchers have also confirmed that the tea polyphenols have antidepressive effects.

Caffeine present in tea acts as a stimulant to the central nervous system. As a result, there is some mood enhancement effect; a sharpening of mental clarity and vigilance; and an enhancement of the higher functions of the brain, as well as the delaying of mental fatigue and increased alertness. A non-protein amino acid mainly derived from tea leaves, L-theanine exerts a calming and mood-boosting effect. The neurotransmitters glutamate and L-theanine possess similarities in structure; it competes with glutamate for the same receptors in the brain and can cross the blood-brain barrier, which allows it to produce a relaxing effect. Apart from this, L-theanine is known to improve the health of the digestive tract, improving the effectiveness of cancer treatments, reducing blood pressure, and enhancing the immunity of the human body. γ-Aminobutyric acid (GABA) present in tea is an important neurotransmitter; it stimulates overall brain activity and has anti-anxiety, antihypertensive, and anti-convulsive effects. Nevertheless, a single compound present in tea may not affect specific brain function. It should be the cumulative actions of multiple compounds. Similarly, these beneficial effects can vary among individuals. For instance, a patient who is diagnosed with moderate depression could get more relief from drinking tea than a patient who has severe depression. Thus, regular consumption of a cup of tea greatly benefits human health in ample ways.