

Benefits of Green Tea: A Review

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ABSTRACT

Green tea is considered one of the most beneficial beverages, not only by traditional Chinese medicine but also worldwide. Green tea is not only a hydrating beverage, but its chemical composition consists of catechins and other polyphenols, which make it responsible for having a health-promoting effect. Green tea also contains certain vitamins and minerals that increase its antioxidant potential. Recent reviews and different studies have shown its health benefits in different diseases like cardiovascular, few forms of cancer, obesity, weight control, skin effects and diabetic control. They also contribute to the betterment of oral health and other physiological functions like anti-hypertensive effects, anti-fibrotic properties, neuroprotective properties, antibacterial and antiviral activity. Considering the vast beneficial effect of green tea, it has been included in the group of beverages with important functional properties. The health benefits and adverse effects of green tea have been reviewed time and again. This review paper is intended to highlight the positive effects of drinking green tea.

Keywords: *Green Tea; Polyphenol; Catechin; Antioxidant*

Introduction:

Camellia sinensis (L.) Kuntze. (Gardner, Ruxton & Leeds, 2007), is the most popular beverage after water consumed worldwide. Green, black and Oolong teas are consumed depending on their fermentation process and antioxidant level (Graham, 1992, Yamamoto *et al.*, 1997). The most significant health effects of different polyphenolic compounds (flavandiol, flavonols, flavonoids, and phenolic acids) found in green tea have been thoroughly investigated and may constitute about 20% of the dry weight (Dulloo *et al.*, 1999). Approximately 3 million tons of different tea leaves are produced per year worldwide, of which 20% are green tea (Cabrera, Artacho & Giménez, 2006). Green tea was first exported from India to Japan in the 17th century. A tea ceremony is held in Japanese society to celebrate the culture of drinking tea. There are two varieties of green tea very popular among the Japanese population: Matcha and Sencha, both derived from the same tea plant but differing mostly in flavour and texture (Wilson, 2018). During the winters in Japan, the farmers covered the tea leaves to protect them from freezing, which led to the harvesting of Matcha tea leaves. The Matcha variety is cultivated after keeping it in shade for a month or two before harvesting. The cultivation method of Matcha tea leaves increases its chlorophyll content along with its amino acid content giving its distinct bright, vibrant green colour and umami flavour. The complete tea leaves are consumed in Matcha providing more health benefits. In the case of Sencha tea leaves, only the leaves are consumed, which are harvested by sun drying throughout the year and then steamed immediately to maintain the colour and nutrient content (Jakubczyk *et al.*, 2020; Horie, Ema & Sumikawa, 2017). History shows that the Western world preferred black tea,

whereas the Asian world consumed more green tea. Recently, green tea has gained global attention due to the presence of naturally preserved potential biochemical contents like polyphenols, catechins and others that have huge health benefits like neurodegenerative diseases, anti-anxiety, cardiovascular disease, anti-inflammatory, cancer, regulating aging, cholesterol, anti-arthritic, and anti-angiogenic impacts (Chacko *et al.*, 2010; Sumpio *et al.*, 2006).

The green tea polyphenols are mostly represented by the flavonols, especially catechins. Amongst all the sources, like chocolate, red grapes, wine, and apples, the predominant source of catechins is green tea (Cabrera, Artacho & Giménez, 2006; Wierzejska, 2014). The main composition of black tea is tannin, and that of green tea is catechins. The caffeine in tea leaves varies depending on the age of the leaf, where younger leaves will have a higher concentration (Dufresne & Farnworth, 2001). Green tea contains 126 mg/100 ml of catechins, according to the European Food Safety Authority (EFSA), whereas, according to the Food and Drug Administration (FDA), green tea contains 71 mg/100 ml of epigallocatechin gallate (Rietveld & Wiseman, 2003). Green tea also contains proteins (15–20% dry weight), minerals and trace elements (5% dry weight), carbohydrates (5–7% dry weight), and trace amounts of vitamins (B, C, E), xanthic bases and lipids (linoleic and linolenic acid), pigments (chlorophyll, carotenoids), and volatile compounds (alcohols, lactones, aldehydes, esters and hydrocarbons). Different minerals like calcium, manganese, selenium, magnesium, fluoride, and zinc are present in different concentrations depending on the age and size of tea leaves (Cabrera, Artacho & Giménez, 2006). The chemical content of fresh tea leaves is 3%–4% methylxanthine alkaloids, which include theobromine, caffeine, theophylline, and phenolic acids (Gulcin, 2006).

Table 1: Composition of Green tea, black tea and its infusion (Cabrera, Artacho & Giménez, 2006)

Compound	Green tea*(%)	Black tea*(%)	Infusion†(%)
Proteins	15	15	trace
Amino acids	4	4	3.5
Fibre	26	26	0
other carbohydrates	7	7	4
Lipids	7	7	trace
Pigments	2	2	trace
Minerals	5	5	4.5
Phenolic compound	30	5	4.5
Oxidised phenolic compounds	0	25	4.5

* Data referred to dry weight

† Black tea, infusion time: 3 min

Literature Review

In Asian folk medicine and traditional Chinese medicine, green tea is used as an effective medicine for treating different diseases (Wierzejska, 2014; Eberhardt, Lee & Liu, 2000). Since green tea can provide many physiological benefits, it is considered a functional food as well. Studies have shown that green tea is also known for its positive effect on blood pressure and heart disease. It possesses high levels of antioxidants and is used for anti-

aging and neuroprotective effects (Afzal, Safer & Menon, 2015). The fresh leaves are heated at high temperatures after harvesting to inactivate the polyphenol oxidizing enzymes, which helps to protect the vitamin content of tea (Yamamoto *et al.*, 1997).

Several reports using animal models show that green tea catechins can provide protection against degenerative diseases (Crespy & Williamson, 2004; Roomi *et al.*, 2005). Studies also suggest that green tea has antiproliferative activity on hepatoma cells and hypolipidemic activity on treated hepatoma rats and can act as a preventive agent in mammary cancer post-initiation. Green tea extract and its isolated components were found to be effective as antitumorigenic agents and as immune modulators in immune dysfunction, which can be caused by either carcinogen treatment or transplanted tumours (Babu, Sabitha & Shyamaladevi, 2006; Unno *et al.*, 2007). They were also found to be effective in controlling neurological problems and oxidative stress. Different findings have shown that green tea possesses antimutagenic, antioxidant, and anticarcinogenic properties that are applied in the prevention of different types of cancer (Koo & Cho, 2004; Yamamoto *et al.*, 1997). The most common cancer among women is malignant breast cancer. The preventive and therapeutic activities of green tea components have shown anticarcinogenic effects against breast cancer in several experimental studies (Zhang *et al.*, 2007). Several reports show that green tea catechins inhibit neuraminidase activity and viral replication by controlling the cellular oxidation reduction process, suggesting that the natural polyphenols, especially the flavonols, can antagonize the proliferation of SARS-Cov-2 (Elmezayen *et al.*, 2021; Aanouz *et al.*, 2021; Enmozhi *et al.*, 2021). The polyphenols were found to be less toxic than any other drugs, and even when consumed at high concentrations, they showed no cytotoxic effect, making them a potential antiviral drug. Green tea has had an inhibitory effect against *Helicobacter pylori*, influenza virus and *Herpes simplex* virus showing its efficiency in treating diarrhea and typhoid since ancient times. They are also effective against adenovirus in in vitro condition. The effectiveness of green tea catechins as antifungal activity against *Candida albicans* in humans has also been studied by Hirasawa and Takada (2004). Studies show that the polyphenol content of green tea has shown activity against a wide range of microorganisms. They slow down the growth of both Gram positive and Gram-negative bacterial species with moderate potency (Yam, Shah & Hamilton-Miller, 1997; Taylor, Hamilton-Miller & Stapleton, 2005).

The catechin called epigallocatechin-3-gallate (EGCG), which is one of the important compounds in green tea with antioxidant properties, helps to prevent the formation of free radicals in the body by stopping cell damage and therefore strengthening the immune system. Research has shown EGCG's ability to help treat various diseases. A significant quantity of essential oils is present in green tea (Ganesan, Kumar & Rao, 2011). The benefits are huge if used properly and under proper guidance (Vuong, 2014). Green tea has a huge role to play in oral hygiene maintenance due to its antibacterial and antioxidant properties (Page & Kornman, 1997; Priya *et al.*, 2015). Several reports have shown that green tea intake can reduce the risk of fatty liver diseases, liver cirrhosis, hepatitis, and chronic diseases (Yin *et al.*, 2015; Fisher *et al.*, 1997). Diabetes, obesity and overweight are growing rapidly throughout the world and are becoming threats to human health, affecting a large number of populations. This threat can be controlled and prevented with

the help of long-term consumption of tea catechins that reduces high fat diet induced obesity and coronary diseases. The photoprotective activity of green tea polyphenols helps in the prevention of solar UVB light induced skin disorders like photoaging, melanoma and others. Several studies suggest that green tea has an anti-wrinkle effect as well (Katiyar, 2003). Green tea shows good ROS scavenging activity, which makes it a potential applicant in antiphotaging therapy. In a recent study, the polyphenol extract of green tea was fed to mice affected by photoaging. The polyphenols seem to increase the collagen level and elastin fibers, which enhanced the skin quality of the mice, thereby showing an antiwrinkle effect (Lee, Kim & Kim, 2014).

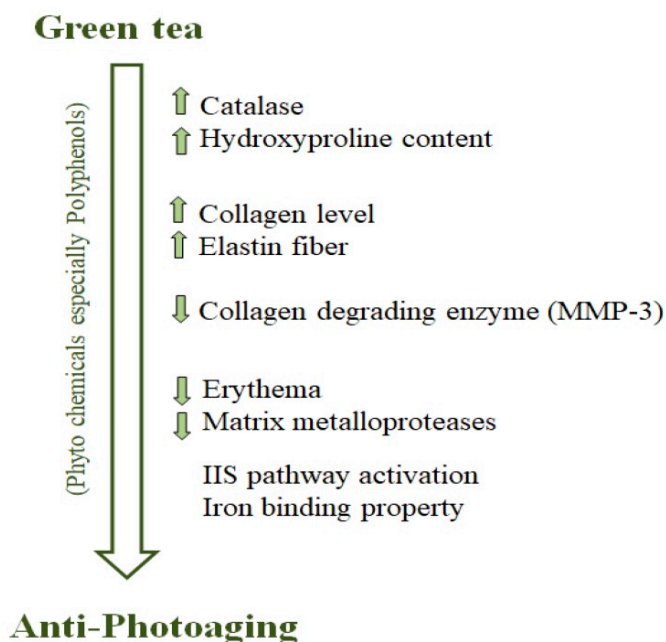


Figure 1: Antiphotaging property of green tea phytochemicals. (Cabrera, Artacho & Giménez, 2006).

Conclusion

Green tea's beneficial health effect is immense, and people are advised to regularly consume this popular and potentially beneficial beverage. Herbs like green tea can be effectively used for different health-related problems, such as the prevention of diabetes, cancer, high blood pressure, obesity, skin diseases, liver cirrhosis, and obesity. This beverage is a natural source for the prevention of the above-mentioned health related issues and is also cost-effective. Several studies are still in progress for the development of more specific methods with more models, along with the development of the best predictive biomarkers, so that a better understanding of the whole interaction of green tea with the endogenous system and exogenous factors can be known. It not only shows beneficial effects but is also rich in antioxidants. Specific research is being carried out all over the world for better future implementation of the health benefits of green tea.

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