

Review Article

Green Tea (*Camellia Sinensis*) Ordinary Beverages or Medicinal Beverages: A Review

Jalal Omid^{*}, Samaneh Abdolmohammadi

Department of Horticulture, Faculty of Agriculture, Guilan University, Rasht, Iran

Email address:

jalalomidi58@yahoo.com (J. Omid)

^{*}Corresponding author

To cite this article:

Jalal Omid, Samaneh Abdolmohammadi. Green Tea (*Camellia Sinensis*) Ordinary Beverages or Medicinal Beverages: A Review. *International Journal of Bioorganic Chemistry*. Vol. 4, No. 2, 2019, pp. 98-100. doi: 10.11648/j.ijbc.20190402.13

Received: November 30, 2019; **Accepted:** December 25, 2019; **Published:** December 31, 2019

Abstract: Tea (*Camellia sinensis*) is one of the most widely consumed beverages in the world. Tea extracts are source of polyphenols, which are antioxidant components. Green tea phenolic compounds are predominately composed of catechin derivatives, although other compounds such as flavonols and phenolic acids are also present in lower proportion. *Camellia sinensis* is commonly known as Tea which is most consummated beverage in the world. The diversify properties of the *C. sinensis* encourage us for new research. There are lots of finding in process on the tea. And there are some positive aspects also found. Present review is an attempt to summarize the various pharmacological effects particularly anti cancer and antioxidant activity may be a powerful tool for future era. In this whole study we can see how much tea is beneficial and may be it will prove a good tool for better treatment option.

Keywords: *Camellia Sinensis*, Green Tea, Tea

1. Introduction

Tea is one of the most widely consumed beverages in the world. Tea plant *Camellia sinensis* (family-Theaceae) has been originated from Southeast China, gradually expanded to India, Sri Lanka and further into many tropical and sub-tropical countries. The tea plant is grown in about 30 countries Worldwide. It grows best in tropical and subtropical areas with adequate rainfall, good drainage and slightly acidic soil. There are two varieties of tea. *Camellia sinensis* var. *sinensis* (China tea) is grown extensively in China, Japan, and Taiwan, while *C. assamica* var. *assamica* (Assam tea) predominates in south and south East Asia, including Malaysia and more recently, Australia [2]. Green tea is widely considered as a health-promoting beverage, and the beneficial effects generally associated with green tea have been attributed to its polyphenol content, particularly to catechins and their antioxidant activity. Green tea contains more catechins than black tea or oolong tea. Catechins are *in-vitro* and *in-vivo* strong antioxidants. In addition, its content minerals and Vitamins increase the antioxidant potential of

this type of tea. It is a widely used medicinal plant throughout India, China and popular in the various indigenous system of medicine like Ayurveda, Unani and Homoeopathy. Green tea has been consumed in all respective ages in India, China, Japan and Thailand. Green tea is believed to be a potent source of beneficial antioxidants, like that found in fruits and vegetables. Tea is particularly rich in polyphenols, including catechins, theaflavins and thearubigins, which are thought to contribute to the health benefits of tea [22]. Over the past 15–20 years, a number of other research studies have been conducted to determine what health benefits can be attributed to consumption of green tea and its extracts. This research has shown that green tea has a variety of potential health benefits. These benefits include anticarcinogenic, anti-inflammatory, antimicrobial, and antioxidant properties, and benefits in cardiovascular disease and oral health.

2. Some Benefits of Green Tea

2.1. Acts as Antioxidant

Green tea is believed to be as a potent source of beneficial

antioxidants, like that found in fruits and vegetables. Tea is particularly rich in polyphenols, including catechins, theaflavins and thearubigins, which are thought to contribute to the health benefits of tea. Animal studies offer a unique opportunity to assess the contribution of the antioxidant properties of tea and tea polyphenols to the physiological effects of tea administration in different models of oxidative stress [5]. The leaf boasts the presence of a well-known antioxidant, among which EGCG (epigallocatechin-gallate) as well as other notable healing substances, including fluoride, catechins, and tannins. Many studies have confirmed the free radicals scavenging activity of EGCG in vitro and in vivo. Tea catechins have been found to be better antioxidants than vitamins C and E, tocopherol and carotene. The antioxidant activity of tea polyphenols is not only due to their ability to scavenge superoxide but also due to increased activity of some detoxifying enzymes such as glutathione peroxidase, glutathione reductase, glutathione-S-transferase, catalase and quinone reductase in small intestine, liver and lungs. The antioxidant properties of tea may prevent atherosclerosis (i.e., hardening, thickening or loss of elasticity of arteries), particularly coronary artery disease [16].

2.2. Oral Health Benefits

During the course of the many research studies done using green tea catechin consumption, it was noticed that the research subjects seemed to have improved oral health after consumption. Research was then launched to focus on the effects of green tea on oral health. Two of the general ways in which green tea consumption helps oral health are due to its anti-inflammatory properties, and antimicrobial activity against mouth flora such as *Streptococcus mutans* [7, 6, 1]. The antimicrobial activity may also be responsible for the improvement observed as to bad breath [19].

2.3. Antiviral Properties

Tea catechins exhibit a protective effect against human immunodeficiency virus (HIV) infection, partly mediated by inhibiting virions to bind to the target cell surface [4, 23]. Kawai et al. investigated the mechanism of the anti-HIV effect of green tea polyphenols and clearly demonstrated that EGCG (but not ECG) directly binds to the cell-surface CD4 molecules [13]. It remains to be seen whether these effects are seen in humans and more studies are needed.

2.4. Antimicrobial Properties

A large amount of research has been performed assessing the antimicrobial scope of green tea catechins. Organisms affected by green tea include a large number of Gram-positive and Gram-negative aerobic bacteria, anaerobic bacteria, viruses, fungi, and at least one parasite. Among the antimicrobial mechanisms that have been attributed to green tea are: damage to the bacterial cell membrane, inhibition of bacterial fatty acid synthesis, inhibition of other enzymes (e.g., protein tyrosine kinase, cysteine proteinases, DNA gyrase, ATP synthase), and inhibition of efflux pump activity [21].

Not only do green tea catechins exhibit direct effects on microorganisms, but they also show activities related to the prevention of infection. Studies using mice and ferrets showed that consumption of green tea could inhibit transmission of bacteria and viruses; and studies with humans showed that consumption of green tea resulted in fewer fever illnesses, fewer illnesses with cold or influenza symptoms, and fewer actual infections with Influenza A or B [20].

2.5. Arthritis

An antioxidant-rich polyphenolic fraction isolated from green tea has been reported to possess anti-inflammatory properties in laboratory animals [8]. One laboratory study reported positive benefits on collagen-induced arthritis in mice. The mice exhibited a significant reduction in the incidence of arthritis (33%) compared with mice not given green tea polyphenols (50%). Analysis showed a marked reduction in the expression of inflammatory mediators such as cyclooxygenase 2, interferon (IFN)- γ , and tumor necrosis factor (TNF)- α in the arthritic joints of the mice fed green tea polyphenols. Additionally, total IgG and type II collagen-specific IgG levels were lower in the serum and arthritic joints of the treated mice [8].

2.6. Anticariogenic Effects

Human and laboratory studies have supported the use of green tea as a preventative measure in dental caries [17, 9]. Salivary amylase hydrolyzes food starch to low molecular weight carbohydrates (maltose) that are easily fermentable. A recent study reported that consumption of tea (black or green) inhibits the release of maltose up to 70% [24]. Black tea was a more potent inhibitor than green tea. Another study reported that a green tea extract was effective in reducing the gingival inflammation caused by periodontal structures such as dentures [1]. An *in vitro* study reported that a green tea extract strongly inhibited *Escherichia coli*, *Streptococcus salivarius*, and *Streptococcus mutans* [18]. The antibacterial effects of green and black tea extracts were comparable with those of amoxicillin, cephadrine, and eugenol.

2.7. Ultraviolet Skin Protection

There have been several animal studies that support the use of green tea in the prevention of ultraviolet (UV)-induced skin carcinogenesis and as topical skin protection against UV radiation [3, 10, 12, 15]. Similar results have been reported from *in vitro* studies on human skin [25]. A recent human study reported that a topical application of EGCg prior to exposure to UV radiation had preventative effects on damage to the skin [11]. A single UV exposure of 4 minimal erythema doses (MED) to human skin was found to increase catalase activity (109–145%) and decrease glutathione peroxidase (GPx) activity (36–54%) and total glutathione (GSH) level (13–36%) at different time points studied. Pretreatment of the skin with EGCg from green tea was found to restore the UV-induced decrease in GSH level and protection of the skin to GPx. Further studies are warranted to elucidate the

preventive effects of EGCg against multiple exposures of human skin to UV light.

3. Conclusions

Human studies suggest that green tea may contribute to a reduction in the risk of cardiovascular disease and some forms of cancer, as well as to the promotion of oral health and other physiological functions such as antihypertensive effect, body weight control, antibacterial and antiviral activity, bone mineral density increase, antifibrotic properties and neuroprotective power. Increasing interest in its health benefits has led to the inclusion of green tea in the group of beverages with functional properties. Other traditional uses of green tea include treating flatulence (gas), regulating body temperature and blood sugar, promoting digestion and improving mental processes. As an herbal remedy, green tea is often recommended to ease stomach discomfort, vomiting and to stop diarrhea. The antibacterial action of tea is useful in treating infections and wounds. The research interest based on tea components may provide an approach to decrease the incidence of and mortality from various diseases. Overall tea is an affordable beverage of natural origin compared to modern beverages such as soft drinks.

References

- [1] Awadalla, H. I.; Ragab, M. H.; Bassuoni, M. W.; Fayed, M. T.; Abbas, M. O. 2011. A pilot study of the role of green tea use on oral health. *Int. J. Dent. Hyg*, 9, 110–116.
- [2] Chan EWC, Lim YY and Chew YL. 2007. Antioxidant activity of *Camellia sinensis* leaves and Tea from a Lowland Plantation in Malaysia. *Food Chemistry*; 102: 1214-1222.
- [3] Elmets CA, Singh D, Tubesing K. 2001. Cutaneous photoprotection from ultraviolet injury by green tea polyphenols. *J Am Acad Dermatol*; 44: 425–432.
- [4] Fassina G, Buffa A, Benelli R, Varnier OE, et al. 2002. Polyphenolic antioxidant (-)-epigallocatechin-3-gallate from green tea as a candidate anti-HIV agent. *AIDS*; 16: 939–941.
- [5] Frei, B., and Higdon, J. V. 2003. Antioxidant activity of tea polyphenols in vivo: Evidence from animal studies. *Journal of Nutrition*, 133 (10), 3275S–3284S.
- [6] Gaur, S.; Agnihotri, R. 2014. Green tea: A novel functional food for the oral health of older adults. *Geriatr. Gerontol. Int.*, 14, 238–250.
- [7] Gupta, D. A.; Bhaskar, D. J.; Gupta, R. K.; Karim, B.; Jain, A.; Dalai, D. R. 2014. Green tea: A review on its natural anti-oxidant therapy and cariostatic benefits. *Biol. Sci. Pharm. Res*, 2, 8–12.
- [8] Haggi TM, Anthony DD, Gupta S. 1999. Prevention of collagen-induced arthritis in mice by a polyphenolic fraction from green tea. *Proc Natl Acad Sci U S A*; 96: 4524–4529.
- [9] Horiba N, Maekawa Y, Ito M, Matsumoto T, Nakamura H. 1991. A pilot study of Japanese green tea as a medicament with antibacterial and bactericidal effects. *J Endod*; 17: 122–124.
- [10] Ichihashi M, Ahmed NU, Budiyo A. 2000. Preventive effect of antioxidant on ultraviolet-induced skin cancer in mice. *J Dermatol Sci*; 23: S45–S50.
- [11] Katiyar SK, Afaq F, Perez A. 2001. Green tea polyphenol (-)-epigallocatechin-3-gallate treatment of human skin inhibits ultraviolet radiation-induced oxidative stress. *Carcinogenesis*; 22: 287–294.
- [12] Katiyar SK, Challa A, McCormick TS. 1999. Prevention of UVB-induced immunosuppression in mice by the green tea polyphenol (-)-epigallocatechin-3-gallate may be associated with alterations in IL-10 and IL-12 production. *Carcinogenesis*; 20: 2117–2124.
- [13] Kawai K, Tsuno NH, Kitayama J, Okaji Y, et al. 2003. Epigallocatechin gallate, the main component of tea polyphenol, binds to CD4 and interferes with gp120 binding. *J Allergy Clin Immunol*; 112: 951–957.
- [14] Krahwinkel T, Willershausen B. 2000. The effect of sugar-free green tea chew candies on the degree of inflammation of the gingiva. *Eur J Med Res*; 5: 463–467.
- [15] Ley RD, Reeve VE. 1997. Chemoprevention of ultraviolet radiation-induced skin cancer. *Environ Health Perspect*; 105: 981–984.
- [16] Miura, Y., Chiba, T., and Tomita, I. 2001. Tea catechins prevent the development of atherosclerosis in apolipoprotein E-deficient mice. *Journal of Nutrition*, 131, 27–32.
- [17] Otake S, Makimura M, Kuroki T. 1991. Anticaries effects of polyphenolic compounds from Japanese green tea. *Caries Res*; 25: 438–443.
- [18] Rasheed A, Haider M. 1998. Antibacterial activity of *Camellia sinensis* extracts against dental caries. *Arch Pharm Res*; 21: 348–352.
- [19] Rassameemasuang, S.; Phusudsawang, P.; Sangalungkarn, V. 2012. Effect of green tea mouthwash on oral malodor. *ISRN Prev. Med.*, 2013, 975148.
- [20] Reygaert, W. C. 2015. Potential for Prevention of Infection by Green Tea. In *Green Tea and Health: Antioxidant Properties, Consumption and Role in Disease Prevention*; Powell, N., Ed.; Nova Science Pub Inc.: Hauppauge, NY, USA.
- [21] Reygaert, W. C. 2014. The antimicrobial possibilities of green tea. *Front. Microbiol*, 5, 434.
- [22] Sharangi A-B. 2009. Medicinal and therapeutic potentialities of tea (*Camellia sinensis* Linn.) - A review. *Food Research International*; 42: 529-535.
- [23] Yamaguchi K, Honda M, Ikigai H, Hara Y, Shimamura T. 2002. Inhibitory effects of (-)-epigallocatechin gallate on the life cycle of human immunodeficiency virus type 1 (HIV-1). *Antiviral Res*; 53: 19–34.
- [24] Zhang J, Kashket S. 1998. Inhibition of salivary amylase by black and green teas and their effects on the intraoral hydrolysis of starch. *Caries Res*; 32: 233–238.
- [25] Zhao JF, Zhang YJ, Jin XH. 1999. Green tea protects against Psoralen plus Ultraviolet A-induced photochemical damage to skin. *J Invest Dermatol*; 113: 1070–1075.