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CAMELLIA SINENSIS: SOURCE OF NEUTRACEUTICALS AND ITS CLINICAL EFFICACY

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ABSTRACT

The health benefits of green tea have been reported against a variety of ailments, including various types of cancer, heart disease, and liver disease. Many of these beneficial effects of green tea are attributed to catechins, particularly (-)- It is related to the content of epigallocatechin-3- gallate. There is evidence from in vitro and animal studies on the mechanisms underlying green tea catechins and their biological effects. Green tea catechins are also used to treat metabolic syndrome such as obesity, type II diabetes, and cardiovascular risk factors. There is also research. Long-term intake of tea catechins may be beneficial against high fat, diet-induced obesity and type II diabetes, and may reduce the risk of heart disease. Further studies should be conducted in accordance with international standards to monitor the pharmacological and clinical effects of green tea and to elucidate its mechanism of action.

INTRODUCTION

Green tea's health-promoting effects are primarily due to its polyphonic content[12], such as flavones and flavonols, which account for 30% of the dry weight of fresh leaves.[1] Recently, many of the above beneficial effects of green tea have been attributed to its most abundant catechin, (-)-epigallocatechin-3-gallate (EGCG).[13-15] Green tea extract is more stable than pure epigallocatechin gallate, one of the main components of green tea, because the extract

contains other antioxidants.[8] In general, herbal medicines are complex mixtures of various compounds, often acting synergistically to produce their full beneficial effects.[11] However, there are relatively few herbal medicines that are well characterized and whose efficacy has been demonstrated in systematic clinical trials. This review article focuses on recent studies on the efficacy, mechanism of action, and side effects of green tea and its catechins in in vitro, in vivo, and ex vivo systems compared to Western medicines.[16]

Green Tea

Tea is one of the most popular drinks around the world. Tea from the camellia sane plant is drunk in various parts of the world as green tea, black tea, or oolong tea.[17] The first green tea was exported from India to Japan in the 17th century. It is estimated that around 2.5 million tonnes of tea leaves are produced annually worldwide, 20% of which is green tea and is consumed mainly in Asia, parts of North Africa, the United States and Europe.[18] The association of tea consumption, especially green tea, with human health has long been appreciated.[19-20] Green tea and black tea are processed differently during the manufacturing process. Green tea is made by steaming the freshly picked leaves immediately to prevent fermentation, resulting in a dry and stable tea. This steaming process destroys the enzymes that break down the pigments in the leaves, allowing the tea to retain its green color during the subsequent rolling and drying processes. These processes preserve natural polyphenols for their health-promoting properties.

Health-Promoting Properties of Green Tea

As mentioned above, green tea is not produced by fermentation unlike black tea production which involves fermentation to oolong tea (partially fermented). The process of complete fermentation to black tea is the result of enzymatic action on the catechin polyphenols found in the leaves of the tea tree.[14] Techniques for processing Camellia Saneness leaves yield different effects for different tea types, resulting in different biologically active components and health-promoting properties.[14-15]

The health-promoting properties of green tea are due to the presence of polyphenols, especially flavonols and flavones. Clinical studies, in vivo and in vitro experiments confirm its antioxidant and anti-inflammatory properties. Catechins are the major polyphenols in green tea and their antioxidant activity stems from their neutralization of free nitrogen and oxygen radicals and their ability to chelate metal ions in redox reactions. Many scientific studies point to the antitumor effects of polyphenols in green tea leaves by inhibiting cell

division and inducing antioxidant phase II enzymes. B. Superoxide dismutase, glutathione S-transferase, glutathione peroxidase and reductase. The results described are relevant to studies on the effects of polyphenols on oxidative stress in vivo. This study showed that consuming four cups of green tea per day reduced urinary levels of 8-hydroxydeoxyguanosine for four months. The effects of green tea polyphenols in inhibiting cancer cell growth and reducing cancer risk are supported by numerous scientific studies in the areas of prostate, pancreatic, breast and gastric cancers.[14,15,16] Although green tea can support both chemotherapy and preventative effects, it should be emphasized that it cannot replace pharmacological treatment. can induce cancer cell deathwithout giving.

The Chemical Composition of Green Tea

From a chemical point of view, green tea contains L-theanine, tyrosine, tryptophan, threonine, 5- N-ethylglutamine, glutamic acid, serine, glycine, valine, leucine, aspartic acid, lysine, and arginine. It also contains trace elements such as magnesium, chromium, manganese, calcium, copper, zinc, iron, selenium, sodium, cobalt, and nickel, and carbohydrates such as glucose, cellulose, and sucrose.[9-10-11-12 -13-14-15-16-17-18-29-21] In addition, green tea is rich in sterols and lipids (linoleic acid, α-linolenic acid, vitamins B2, B3, C), most of which are added to gyokuro tea (approximately 10 mg) and sencha (4 mg), vitamin E, and trace ingredients. It contains. Vitamin A from vitamin K is only found in matcha. It is also important that green tea is very rich in macro elements. It is a source of fluorine, iodine and phosphorus. The content of diphenylpropanoid backbone (C6C3C6) is also a typical feature of green tea.[10-11-12] In addition, green tea is rich in xanthine bases, including pigments such as theophylline and caffeine[20], carotenoids and chlorophyll. Note that the chemical composition of green tea also contains phenolic acids with volatile compounds such as gallic acid and alcohols, esters, hydrocarbons and aldehydes. Phenolic acids, including proanthocyanidins, and gallates, including monosaccharides, have a significant impact on the quality of green tea infusion.

The phenolic acids already mentioned belong to the group of polyphenols together with flavonoids, flavandiols and flavols. Based on available data, these compounds may account for upto 30% of the dry matter in green tea. Catechins are the standard flavonoids found in green tea. Green tea contains far more catechins than black or oolong tea. As previously mentioned, the group of catechins includes EGCG, ECG, EGC, and EC.[10-11-12-13] Below (Figure 1) are the chemical structures of green tea catechins. In addition to the number of

hydroxyl groups, their distribution is equally important when considering the antioxidant effect of catechins. Catechins with catechin group have lower antioxidant potential compared to those with pyrogallol group., the antioxidant effects of catechins depend not only on their chemical structure, but also on environmental conditions.[10-11-12-13-14-15-16-17-18]

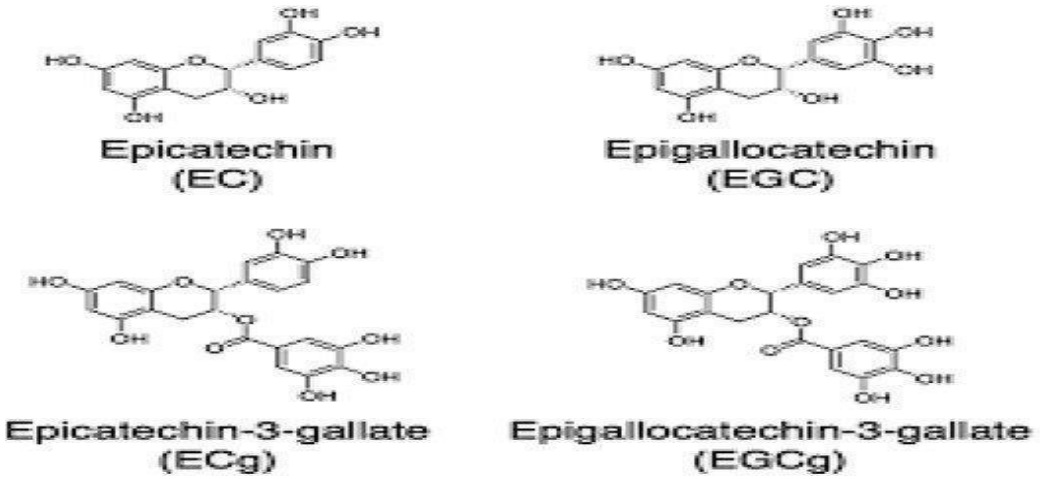

Figure 1: **Chemical structure of green tea catechins.**

Each chemical component in green tea has radically different effects on specific types of cancer. Available data indicate that ascorbic acid, arginine, proline, lysine, and EGCG are effective in suppressing tumor growth. The diagram below (Table 1) shows the chemical composition of green tea broken down into lipids, amino acids, trace elements, phenolic acids, vitamins, carbohydrates and volatile compounds**.**

Chemical composition of green tea

Amino acids

L-theanine
Tyrosine
Tryptophan
Threonine 5-N-ethylglutamine
Glutamic acid
Serine
Glycine
Valine
Leucine
Aspartic acid
Lysine
Arginine

Carbohydrates

Glucose
Cellulose
Sucrose

Volatile compounds

Alcohols
Esters
Hydrocarbons
Aldehydes

Lipids

Linoleic acid
α-linolenic acid

Vitamins

Vitamin A
Vitamin B2
Vitamin B3
Vitamin C
Vitamin E
Vitamin K

Trace elements

Magnesium
Chromium Manganese
Calcium
Copper
Zinc
Iron
Selenium
Sodium cobalt
Nickel

Phenolic acids

Gallic acid

Table 1: Chemical compounds of green tea.

Catechins

Modes of Action

EGCG is the best-studied catechin derivative to date. The catechin content in green tea depends mainly on its variety, cultivation method, tea leaf processing method, steeping time and temperature. Studies have shown that catechins achieve the highest stability in the pH range of 4 Available data demonstrate antitumor, antioxidant, anti-inflammatory, antibacterial, antiviral, antidiabetic, antiobesity, and hypertensive effects of catechins. It's also worth highlighting its positive effects on Gram-positive and Gram-negative bacteria, viruses, fungi, and prisons. catechin also acts as a metal ion deceiver for copper and iron ions. The specific chemical structure of polyphenols in green tea (the presence of at least five hydroxyl groups) has a significant impact on their antioxidant capacity. The di/trihydroxy structures on the B and D rings and the meta-5,7-dihydroxy group on the A ring enable chelation of transition metal ions. However, under certain conditions, it may exert pro-oxidant effects. Regulation of catechins under the intracellular pool of nitro-oxidative stress is primarily responsible for their anticancer properties. Therefore, polyphenolic compounds that confer health-promoting properties on the body may also have adverse effects when very high doses of catechins are used. As a result, prooxidative stress and oxygen damage to cellular components are induced. increase. In addition, polyphenols also have pro-oxidant effects in the presence of tyrosinase or peroxidase, i.e. oxidizing enzymes. In addition, pro-oxidant effects are closely associated with inflammatory processes. Like their antioxidant properties, the pro-oxidant properties of catechins are similarly dependent on factors such as the number of hydroxyl groups in the molecule. During the process of polyphenol oxidation, cellular molecules are damaged by reactive oxygen species and electrophilic quinones. This factor is important for the pathogenesis of degenerative diseases and carcinogenic processes.

Differences between Black Tea and Green Tea

Black tea differs significantly from green tea, especially in its chemical composition and fermentation and oxidation processes. Like green tea, black tea is rich in many catechins and theaflavins. namely, theaflavin (TF1), theaflavin-3-monogallate (TF2a), theaflavin-3'-monogallate (TF2b), and theaflavin-3,3'-digallate (TF3). Numerous articles describe the molecular mechanisms of black tea extraction and individual theaflavins. Data show that black tea is composed of phenolic acids, flavanols, thearubins, amino acids, proteins, methylxanthines, minerals and volatiles, in addition to catechins and theaflavins. However, both thearubin and theaflavins are known to be products of tea polyphenols. Key molecular

mechanisms of black tea polyphenols include activation of mitochondrial cell death signaling pathways and reactive oxygen species scavenging effects. In addition, molecular effects of polyphenols in black tea include activation of nuclear factor erythroid 2-related factor 2 (Nrf2). It is involved in the regulation of gene expression, regulation of antioxidant and detoxification enzymes. In particular, the anti-estrogenic effects of black tea consumption may significantly reduce the risk of malignant neoplasms in women.

Theaflavin 1 prevents lung tumor development in cell and animal models by inducing apoptosis, downregulation of fatty acid synthesis, and COX-2. Theaflavin2 induced cell death by regulating her BAX and p53 proteins in Heal and WI38VA cervical cancer cell lines. The chart below compares the polyphenol content of green tea and black tea broken down into theaflavins andcatechins.

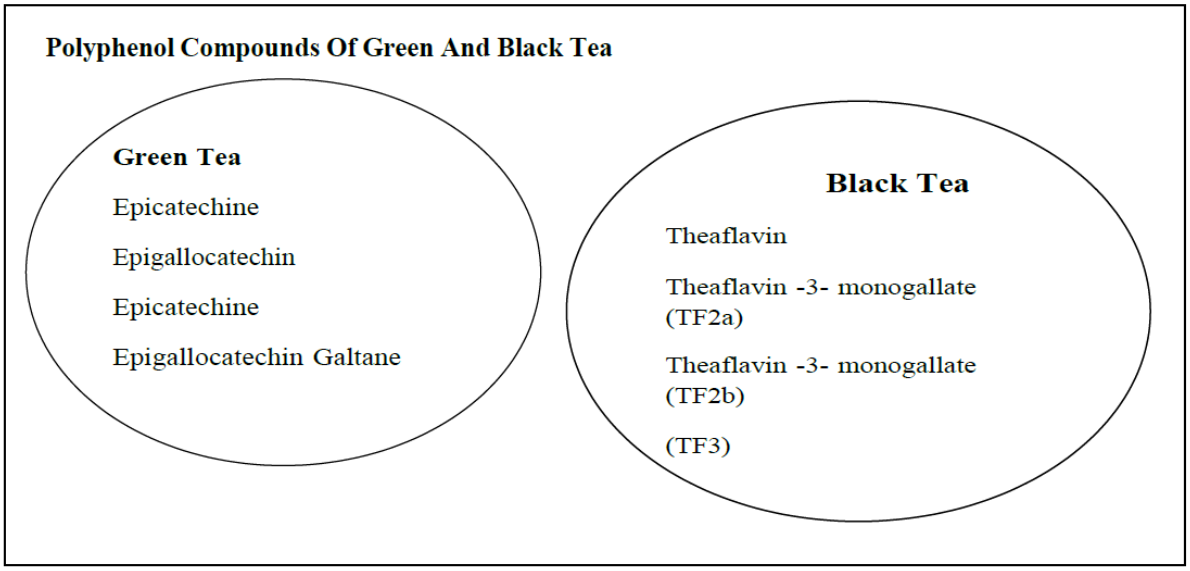

Table 2: Comparison of polyphenol content in green and black tea.

Clinical Efficacy Evaluation Of Anti-Greasy Green Tea

- Non-alcoholic fatty liver disease (NAFLD) is a chronic liver disease characterized by excessive lipid accumulation in the liver unrelated to alcohol consumption. NAFLD can progress to nonalcoholic steatohepatitis (NASH), fibrosis, and ultimately cirrhosis, hepatocellular carcinoma, and liver failure.
- Patients belonging to certain risk categories, such as obesity, type II diabetes, hyperlipidemia, insulin resistance, and those on a high-fat diet (HFD) are particularly susceptible to NAFLD. Approximately 20-33% of adults in the United States suffer from her NAFLD, resulting in an estimated annual economic burden of $103 billion in direct

costs.

- Although there is no Food and Drug Administration-approved treatment for NAFLD or NASH, some treatment strategies can reduce the symptoms of NAFLD. Dietary and lifestyle changes can help limit caloric intake, increase physical activity, and improve liver histology. Limit and prevent excessive inflammation and oxidative stress. However, most drugs have limited success or have significant limitations. B. Long-term administration is not sustainable.
- Clinical trials of some drugs have not shown high efficacy, while others have examined only a small number of participants.
- Green tea catechins are dietary supplements that have been extensively studied for NAFLD over the past two decades. Green tea extract (GTE) is rich in flavonoids and has excellent anti- inflammatory, antioxidant and antilipidemic properties.
- The potential benefits of EGCG have been demonstrated in various in vitro and in vivo studiesin animal models and various clinical studies in patients with NAFLD. In addition to its significant benefits in NAFLD, EGCG also has beneficial effects on cancer, cardiovascular disease, type II diabetes, and metabolic health.
- Focuses on clarifying the mechanism of anti-inflammatory action of his GTE through regulation of nuclear factor κB. activation (NFκB), human research focused.
- Mahmudi et al. From a previous randomized clinical trial of NAFLD, we examined the effects of GTE on liver enzymes. This manuscript provides a systematic review of the effects of EGCG and GTE observed in NAFLD in rodent and human studies, including clinicopathologic phenotypes, lipid and carbohydrate metabolism, inflammatory and oxidative stress markers, and surpasses previous reviews by tabulating the effects of EGCG on liver enzymes. User-friendly form.

CONCLUSION

Laboratory studies have shown the health effects of green tea. Clinical evidence in humans is still limited, so future studies will be needed to define the true magnitude of the health benefits, determine the safe range of tea consumption associated with these benefits, and assess the effects of tea consumption. The mechanism needs to be elucidated. The development of better predictive biomarkers, as well as more specific and sensitive methods using more representative models, will enable green tea to interact with endogenous systems and other exogenous factors. A better understanding of how they interact. Definitive conclusions regarding the protective effects of green tea must come from well-designed

observational epidemiological and intervention studies. The development of biomarkers of green tea consumption and molecular markers of its biological effects will facilitate future research in this field.

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