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**BOTANICAL DESCRIPTION, PHYTOCHEMISTRY, TRADITIONAL
USES, AND PHARMACOLOGY OF GREEN TEA (*CAMELLIA SINENSIS*):
AN UPDATED REVIEW**

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ABSTRACT

Tea is the most popular beverage consumed in the world after water. After water, tea is the most popular beverage in the world. Green tea is a non-fermented tea with higher catechins than black or oolong tea. Tea, which originated in China, has acquired popularity across the world in the last 2000 years. Tea has a definite economic and social importance, and its intake is part of many people's daily routine, both as a daily drink and as a therapeutic aid in various ailments. Green tea is a non-fermented tea with higher catechins than black or oolong tea. Tea, which originated in China, has acquired popularity across the world in the last 2000 years. Tea has a definite economic and social importance, and its intake is part of many people's daily routine, both as a daily drink and as a therapeutic aid in various ailments. Increasing evidence indicates that green tea extracts as well as their main component, the polyphenol epigallocatechingallate (EGCG),

has multiple health benefits, such as the anti-stress, anticancer and antioxidants effects. Green tea has been consumed throughout the ages in India, China, Japan, and Thailand. Green tea was used in ancient Chinese and Indian medicine as a stimulant, diuretic (to encourage urine excretion), astringent (to control bleeding and assist heal wounds), and to improve heart health. Green tea has also been used traditionally to cure flatulence (gas), regulate body temperature and blood sugar, promote digestion, and improve brain functions.

Keywords: Phytochemistry, Pharmacology, Green Tea *camellia sinensis*

INTRODUCTION

According to estimates, 75 percent of the world's population utilizes herbs or their extracts from plants for medicinal purposes [1]. Furthermore, approximately 80% of the world's developed countries depend on traditional drugs, mostly plants or their derivatives, for their essential healthcare needs [2]. In the current scenario, it is estimated that medicinal plants and their derivatives account for up to 50% of all medicines used in medical treatments. Plants and plant-derived chemicals have been used to treat a variety of illnesses and disorders all over the world since the dawn of time. Most people all over the world also depend on traditional herbal medicine (medicinal plants and/or their derived materials) to treat everyday health-related problems. According to the World Health Organization (WHO), "traditional medicine" refers to the experience and methods of herbal healing for the prevention, diagnosis, and treatment of physical, psychiatric, or social imbalances.

Plants have always been an excellent source of medicines, and all of the drugs that are currently available were extracted directly or indirectly from them. Plants include about 25% of the medications prescribed globally, with 121 active compounds currently in use. According to WHO, 252 drugs are considered to be fundamental and necessary, 11 percent of which are entirely of plant origin, and a large amount are synthetic drugs derived from natural precursors [3].

Ayurveda is a traditional medicinal science that focuses on disease diagnosis and herbal drug recovery. However, the medicinal effects of herbal medications such as tea have not yet been widely disseminated for disease control [4].

Tea is the most consumed drink in the world after water. Originating from China, tea has gained the world's taste in the past 2000 years. The economic and social interest of tea is clear and its consumption is part of many people daily routine, as an everyday drink

and as a therapeutic aid in many illnesses. Green tea is made from *Camellia sinensis* leaves. It is a 'non-fermented' tea. It is consumed in different parts of the world as green, black, or Oolong tea. Among all of these, the intake of green tea has been shown to have the most positive impact on human wellbeing [5]. Increasing evidence indicates that green tea extracts as well as their main component, the polyphenol epigallocatechingallate (EGCG), has multiple health benefits, such as the anti-stress, anticancer and antioxidants effects. Green tea has been consumed throughout the ages in India, China, Japan, and Thailand. In traditional Chinese and Indian medicine, practitioners used green tea as a stimulant, diuretic (to promote the excretion of urine), astringent (to control bleeding and help heal wounds), and to improve heart health. Other traditional uses of green tea include treating flatulence (gas), regulating body temperature and blood sugar, promoting digestion, and improving mental processes [6].

Aim and Objectives

To evaluate the study of Green tea in human body

Methodology

The material is collected from various articles, textbooks, Samhitas, internet or

authentic website sources like Google scholar, pub med, etc.

Geographical description [7,8]

It is an evergreen shrub or small tree that is usually trimmed to below two metres (six feet) when cultivated for its leaves. It has a strong taproot. The flowers are yellow-white, 2.5-4 cm in diameter, with 7 to 8 petals. The seeds of *Camellia sinensi* sand *Camellia oleifera* can be pressed to yield tea oil, a sweetish seasoning and cooking oil that should not be confused with tea tree oil, an essential oil that is used for medical and cosmetic purpose and originates from the leaves of a different plant. The leaves are 4-15 cm long and 2-5cm broad. The young, light green leaves are preferably harvested for tea production; they have short white hair on the underside. Older leaves are deeper green.

Taxonomy [9]

About 325 species of genus *Camellia* are scattered mainly in different parts of the world. However, *sinensis* species of this pant shows exorbitant growth. The taxonomical data of this plant is detailed below

Kingdom	: Plantae
Order	: Ericales
Family	: Theaceae
Genus	: Camellia
Species	: C. sinensis

Binomial name: *Camellia sinensis* (L.)
Kuntze

Properties of Green tea ^[10]

Guna: Grahi, Mridu Uttejaka, Swedala, Mutrala, Nidranashaka.

Indication: Trishna, Ardhaavabedhaka, Hrid Shola, Netra Shola, Arsha, Shotha.

Its rasapanchaka explained by Acharya Saligrama as

Rasa: Kashaya,

Guna: teekshna, ushna, laghu,

Veerya: Ushna,

Karma: Deepana, Paachana, and doshagnata as kapha pitta hara, kinchitvataprakopaka

Phytochemicals Constituents ^[11]

Detailed phytochemical analysis of green tea extract reveals the presence of alkaloids (3-4%), amino acids (1-4% dry weight), carbohydrates (5-7% dry weight), minerals and trace elements (5% dry weight), lipids,

sterols, vitamins, xanthenes, pigments, phenolic acids, polyphenols. Health benefits of green tea are primarily due to polyphenols ^[12]. Green tea includes polyphenols such as flavanols, flavandiols, flavonoids, and phenolic acids, which may reach up to 30% of the dry weight. The majority of green tea polyphenols (GTPs) are flavonols, which are also known as catechins. Polyphenols contained in teas are classified as catechins. Green tea contains six primary catechin compounds: catechin, gallaogatechin, epicatechin, epigallocatechin, epicatechin gallate, and apigallocatechin gallate (also known as EGCG). EGCG is the most reported and active polyphenol component in green tea ^[13].

Furthermore, The chemical constituents of green tea are listed in a table as below ^[14-18].

Table 1: Chemical constituents of green tea

Chemical constituents	Examples
amino acids (1-4% dry weight)	theanine or 5-N-ethylglutamine, glutamic acid, tryptophan, glycine, serine, aspartic acid, tyrosine, valine, leucine, threonine, arginine, and lysine
carbohydrates (5-7% dry weight)	cellulose, pectins, glucose, fructose, and sucrose
minerals and trace elements (5% dry weight)	calcium, magnesium, chromium, manganese, iron, copper, zinc, molybdenum, selenium, sodium, phosphorus, cobalt, strontium, nickel, potassium, fluorine, and aluminium
Lipids	linoleic and a-linolenic acids
Sterols	Stigmasterol
Vitamins	Vitamin B, C and E
Methylxanthines	caffeine, theophylline, theobromine,
Pigments	chlorophyll, carotenoids

The occurrence and biological significance of main phytoconstituents is discussed below:

EGCG (Epigallocatechin-3-gallate) ^[19]:

EGCG is the paramount constituent of Green tea. Found in the highest concentration in green tea, it is the most

active and best researched of all green tea ingredients. It has been found to be over 100 times more effective in neutralizing free radicals than vitamin C and 25 times more powerful than vitamin E. It also tops other antioxidants, such as butylated-hydroxyanisole (BHA), butylated-hydroxytoluene (BHT) and resveratrol.

Other Polyphenols ^[20]:

Dry green tea contains 2% to 3% of theogallin, which is unique only to tea. It also contains depsides such as chlorogenic acid and coumarylquinic acid.

Theanine ^[21]:

Dried tea extract contains 4% to 6% of theanine, an amino acid found only in tea. It is what gives tea the characteristics flavor. Catechins and caffeine taste bitter and astringent, but theanine tastes sweet and fresh. Catechins have been drumming their benefits in recent years. But it is for theanine that tea lovers have yearned for centuries. Theanine stimulates alpha brain waves, calms the body and promotes relaxed awareness. It is the interplay between

catechins, theanine and caffeine that makes green tea such a fascinating beverage.

Caffeine ^[22-24] :

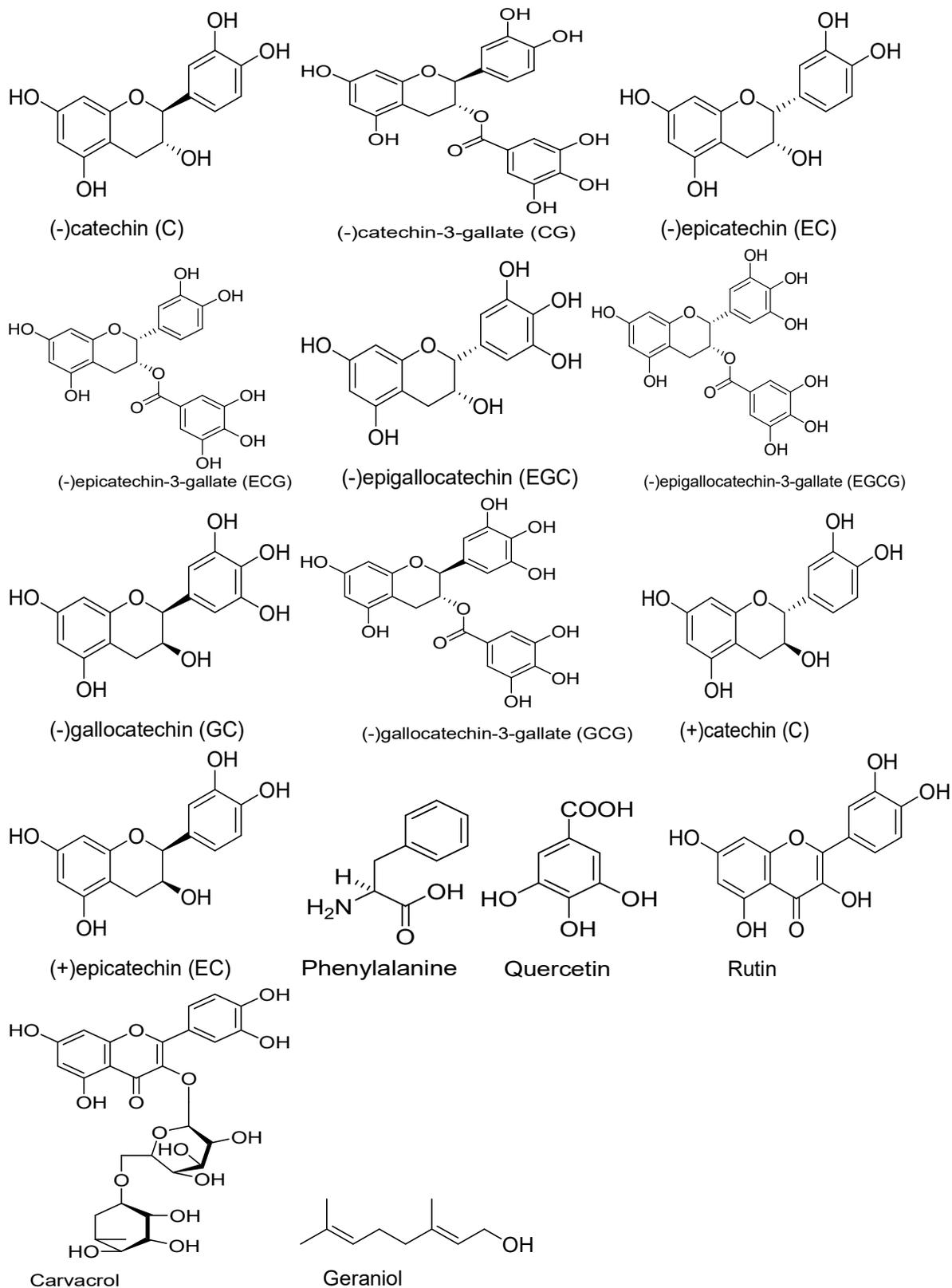
Caffeine is a plant alkaloid found in coffee, tea and cocoa. It acts as natural pesticide, protecting plants against certain insects feeding on them. Green tea contains alkaloids known as methylxanthines such as caffeine, theobromine and theophylline. Graham found that fresh leaves contain, on average, 3% to 4% of caffeine and very small amounts of the other methylxanthines.

Vitamins and Minerals ^[25]:

Green tea contains several B vitamins and C vitamin. Being less processed than black tea, these vitamins are left intact in the tea-making process. Other green tea ingredients include 6% to 8% of minerals such as aluminium, fluoride and manganese. Green tea also contains **organic acids** such as Gallic and quinic acids, and 10% to 15% of carbohydrate and small amount of volatiles.

Structures

Chief bioactive constituents isolated from green tea:



Traditional uses ^[26,30]

Green tea extracts as well as their main component, the polyphenol epigallocatechingallate (EGCG), has multiple health benefits, such as the anti-stress, anticancer and antioxidants effects. Green tea has been consumed throughout the ages in India, China, Japan, and Thailand. In traditional Chinese and Indian medicine, practitioners used green tea as a stimulant, diuretic (to promote the excretion of urine), astringent (to control bleeding and help heal wounds), and to improve heart health. Other traditional uses of green tea include treating flatulence (gas), regulating body temperature and blood sugar, promoting digestion, and improving mental processes. Green tea has a wide range of applications. It can be used as a CNS stimulant in the form of a tea, as well as a diuretic, to relieve sunburns, sore eyes, blisters, bleeding gums, treat the common cold, and as a sterilizing agent for certain forms of bacteria that cause food poisoning. The tea plant contains natural fluorine and the catechin glucosyl transferase, which prevents cavities by destroying the cariogenic bacteria that cause plaque and oral bacteria that cause bad breath; it effectively inhibits the abnormal formation of blood clots (thrombosis), the leading cause of heart attacks and stroke; it contains less caffeine

than coffee; it refreshes the body, especially the central nervous system; and it has less caffeine than coffee.

Pharmacological activities

Green tea has been thoroughly researched in humans, wildlife, and laboratory studies. According to the findings of these trials, green tea can be beneficial for the following health conditions.

Atherosclerosis ^[31-35]

According to population-based studies, green tea's antioxidant properties can help prevent atherosclerosis, especially coronary artery disease. (Population-based experiments are those that track large numbers of people over time and/or compare groups of people with various backgrounds or with different eating patterns, for etc).

High cholesterol ^[36-38]

In studies, it is proved that Green tea reduces overall cholesterol and increases HDL ("good") cholesterol in both animals and humans. According to one population-based report, men who drink green tea have lower overall cholesterol than men who do not drink green tea. According to the findings of one animal study, polyphenols in green tea can inhibit cholesterol absorption in the intestine and promote its excretion from the body. Green tea has displayed that it substantially lower blood levels of unhealthy

LDL cholesterol in another similar study of male smokers.

Diabetes ^[39,40]

Green tea has long been used to help regulate blood sugar levels in the body. According to animal studies Green tea can help prevent the development of type 1 diabetes and delay its progression, Type 1 diabetes patients contain little to no insulin, a hormone that transforms glucose (sugar), starches, and other carbohydrates into the energy required for everyday living. Green tea can aid in the regulation of glucose levels in the body.

Obesity ^[26]

Epidemiological evidence suggests that green tea could be an innovative method for the treatment or prevention of obesity. Green tea has been found to reduce obesity when consumed on a regular basis. Anti-obesity effect of Green tea has been linked to its caffeine and catechin content, especially (–)-epigallocatechin-3-gallate (EGCG). Many human epidemiological trials have shown that green tea or green tea catechins rich in EGCG can help with weight loss. Green tea or its catechins help to reduce body mass index (BMI), body weight, and body fat by rising postprandial thermogenesis and fat oxidation and thereby lowering cholesterol.

Cancer

Green Tea Polyphenols (GTP), specifically EGCG or EGCg (epigallocatechin gallate), not only inhibit an enzyme required for cancer cell development, but also destroy cancer cells while having no negative effects on healthy cells. According to new research, the polyphenols in green tea can play an important role in cancer prevention. Polyphenols are also believed to help destroy cancerous cells and slow their growth ^[41-44].

Liver disease ^[45]

According to population-based research, men who drink more than 10 cups of green tea a day are less likely to experience liver diseases. Green tea also appears to shield the liver from the harmful effects of toxins such as alcohol. Green tea has been shown in animal studies to help protect against the growth of liver tumors in mice. Several animal and human studies indicate that catechin can aid in the treatment of viral hepatitis (inflammation of the liver from a virus). Catechin was isolated from green tea and used at very high amounts in these trials. It is unclear if green tea (which has less catechins) provides the same benefits to people with hepatitis. [66]

Alzheimer's disease ^[26]

Researchers have also found that Green tea have the ability to improve brain function and prevent age-related brain degeneration.

Specifically, EGCG helps to reduce the development of the protein beta-amyloid, which can build up in the brain over time, causing nerve damage and memory loss¹² – a disorder similar to Alzheimer's disease.

CONCLUSION

It is clear that as much as tea has been studied, its composition is still not adequately understood. In view of its interesting pharmacological properties it would be ideal for a program of analytical analysis to be carried out on well- developed teas in a quantitative manner. Teas used in pharmacological studies should be classified according to their form, source, and method of production. Analytical results such as caffeine and catechin content would be desirable. Methods of preparation should be defined when using tea extracts or fractions. The teas, as well as the scientific evidence on them, should be made available to researchers interested in their pharmacological and biochemical properties. The preparation of regular dried aqueous extracts of these teas will be a further refinement, eliminating differences in sample preparation for in vivo and in vitro experimentation.

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