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REVIEW ARTICLE

Green Tea – An Herbal Drug: A Review

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ABSTRACT

Green tea, produced from the plant *Camellia sinensis* is an affluent source of poly – phenolic compounds which are extremely beneficial against degenerative diseases like arthrosclerosis, Diabetes, Rheumatism, Parkinsonism, several cancer and has been used in Traditional system of medicine in many Asian countries. Epigallocatechin – 3 –gallate is the most abundant catachin found in green tea and plays a pivotal role in green tea medicinal properties. The potential health benefits ascribed to green tea include: antioxidant, cancer chemoprevention, improved cardiovascular health, anti-inflammatory, hepatoprotectant and immunomodulator.

Keywords: *Camellia sinensis*, Epigallocatechin, Catechins, antioxidant, anticancer.

INTRODUCTION

Green tea is a type of tea made solely with the leaves of *Camellia sinensis* that has undergone minimal oxidation during processing.[1] Green tea originates from China and has become associated with many cultures in Asia from Japan to the East.[2] Green tea is consumed as a beverage as well as for its health benefits in different parts of world.Well tea is mainly of three varieties – green, black and oolong.[3] While other tea is made of fermented leaves Green tea is made of unfermented leaves. It has the highest content of antioxidants called polyphenols [4]. The primary function of polyphenol is to scavenge the free radicals that occur in the body. Free radicals occur naturally in the body causing the ageing process and numerous health hazards like cancer and heart diseases.[5] Antioxidants may neutralize the free radicals and reduce the damage caused by them. Green tea has been traditionally used in China as a stimulant, diuretic, astringent, treating gastric problems, promoting digestion, enhancing mental processes and improving heart health.[6] In India it mainly grows in the Bherjan Estate, Assam; Ambootia Tea Estate and Makaibari Tea Estates, Darjeeling; Craigmore Estate, nilgiris. Its color is light- dark green powder, Size - 4-15 cm long and 2-5 cm broad, available in Green, Black and Oolong varieties. It is cultivated in tropical and subtropical.[7] climate in acidic soil, at altitude of 1500 meter (5000 ft.). Only the top 1-2 inches of the

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mature plant are picked [9-11].

CHEMICAL CONSTITUENTS

The active constituents in Green Tea are, catechin polyphenols, epigallocatechin gallate (EGCG),vitamin & mineral, amino acid & other nitrogenous compound, inorganic elements and carbohydrates etc. Green tea ingredients are extremely complex. It contains as many as 200 bioactive compounds.[8]

Polyphenols: [16 - 18] The largest and most important chemical compound is **polyphenols**. polyphenols are important because they contain flavonoids - an important class of antioxidants. But high levels of polyphenols make bad green tea. This is because they are astringent (a dry mouth feeling) tasting. Therefore Chinese and Japanese green tea plants tend to have lower level of polyphenols than black tea plants. Polyphenol contains flavonoids (catechin, epicatechin, epicatechin gallate, epigallocatechin gallate.) [12 -15].

Catechins According to scientist Graham Harold, dried tea extract can contain 30% to 40% of catechins. [19] The four main catechins are: shown in **Fig 1**

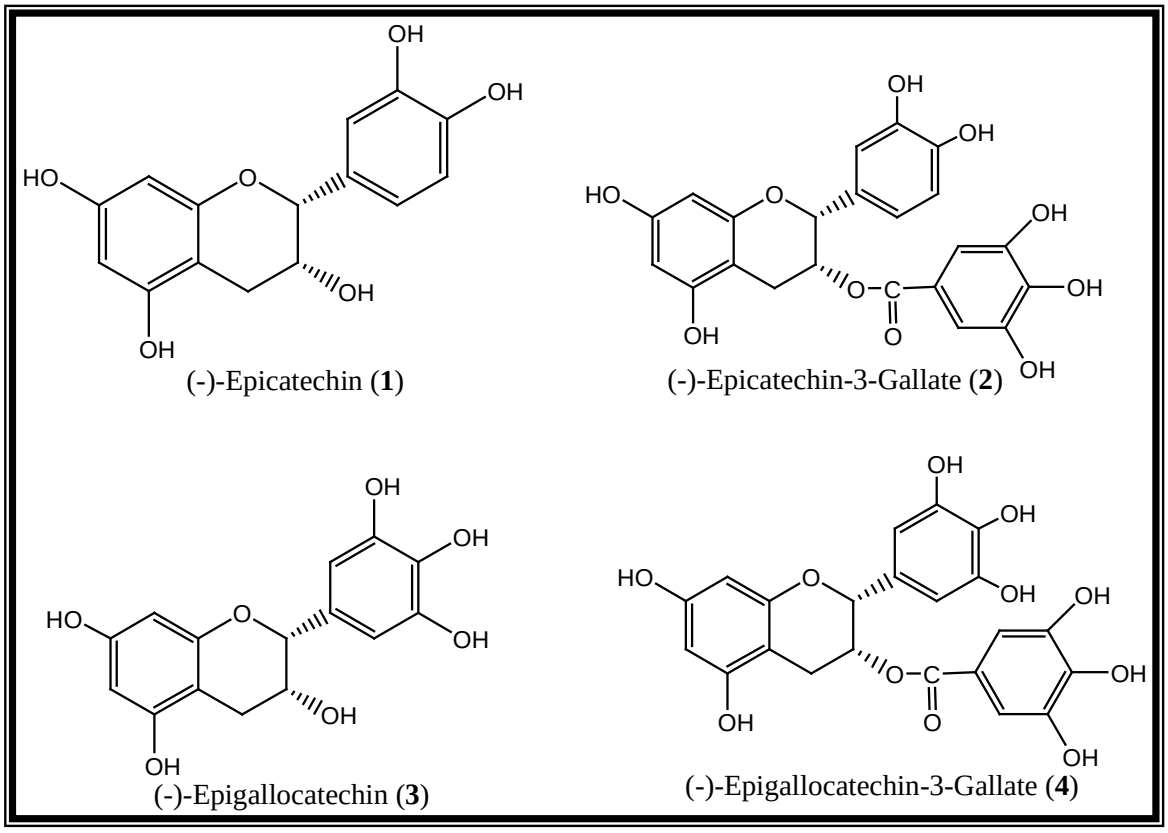

Fig 1: Structure of Epicatechin, (1) Epicatechin -3-gallate, (2) Epigallocatechin, (3) Epigallocatechin-3-gallate (4)

Dried green tea leaves generally contain from 8-12% total polyphenols Epigallocatechin gallate is considered the most significant active compound.EGCG is a powerful anti-oxidant, inhibiting the growth of cancer cells, it kills cancer cells without harming healthy tissue. It has also been effective in lowering LDL cholesterol levels, and inhibiting the abnormal formation of blood clots. [19]

Caffeine: 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 32 mg caffeine. Green tea contains alkaloids known as methylxanthines such as caffeine, theobromine and theophylline. **:** It acts as natural pesticide, protecting plants against certain insects feeding on them. Graham found that fresh leaves contain, on average, 3% to 4% of caffeine and very small amounts of the other methylxanthines. [6, 7, 9-11]

Vitamins and Minerals: Green tea contains several vitamins B and vitamin C. 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.

Theanine: Dried tea extract contains 4% to 6% of **theanine**; it gives tea the characteristics flavor. Catechins and caffeine taste bitter and astringent, but theanine tastes sweet and fresh. Theanine stimulates alpha brain waves, calms the body and promotes relaxed awareness causing agents. [6, 7, 9-11]

Carbohydrate: Green tea contains 40% carbohydrate. Carotenoids, tocopherols, ascorbic acid (vitamin C), minerals such as chromium, manganese, selenium or zinc, and certain phytochemical compounds. [6, 7, 9-11]

ANTICANCER ACTIVITY

Skin Cancer: Polyphenols from green tea have anti-inflammatory & anti cancer

property that help in prevention of onset & growth of skin tumor. EGCG is the major and most photo protective polyphenolic component of green tea.

Breast Cancer: EGCG inhibit the activity of enzyme, telomerase,(imp. role in cell division) Green tea inhibit the interaction of tumor promoters,hormoters ,&growth factors with their receptors producing

CURATIVE ACTION OF GREEN TEA

Anti-inflammatory Effect: The risk of heart attack is further reduced by the anti-inflammatory effect of the green tea catechins. The EGCG prevents the inflammatory reactions from occurring in the blood vessels of the heart.

Cardiovascular health: Green tea helps to protect against cardiovascular disease. It improve blood vessel reactivity, reduce both blood pressure and arterial stiffness, indicating a notably better cardiovascular health profile. Drinking green tea rapidly improves the health of the delicate cells lining the blood vessels and helps lower one's risk of heart disease. Green tea improves the function of endothelial cells. Endothelial cell dysfunction plays a key role in the development of clogged arteries, a process called atherosclerosis. [20]

ANTICARCINOGENIC ACTIVITY:

The anticarcinogenic effect of green tea on gastric cancer: EGCG significantly inhibits DNA synthesis ,protein tyrosine kinase activities of epidermal growth factors (EGF) receptor EGCG inhibits the process of tumor formation by blocking cellular signal transduction pathways. Tea also block cancer causing compound such as nitrosamines, suppresses, the activation of carcinogens & detoxifies and traps cancer.

growth arrest of the tumor Regular use prevents breast cancer in early stage cases due to inhibitory action of polyphenols on growth of breast cancer cells. [7]

Ovarian cancer: EGCG not only suppresses the growth of ovarian cancer cells, but also includes apoptosis (cell suicide) in these cells by affecting a number of genes and proteins. EGCG from green tea inhibited the endothelin A receptor, endothelin-I axis which is over expressed in ovarian cancer. EGCG also reduce angiogenesis, vascular endothelial growth factor and tumor proteinase activation.

Fat Loss: Green tea contain three major component that promote fat loss; Catechins, caffeine and theanine. Green tea polyphenols promotes fat loss by inhibiting both gastric and pancreatic lipase. It increases the activity in the cells and tissues of the body which result in burning up of these extra calories thereby preventing their storage. The formation of fat cells in the body is kept under check with regular consumption of green tea. Catechins stimulate the use of fatty acids by liver and muscle cells. In muscle cells, the ability to burn more fats.

Anti Diabetic: The green tea polyphenols inhibit the action of such enzymes thereby helping the liver to function more efficiently. Furthermore, the production of glucose within the liver is also reduced to a certain extent. The breakdown of glucose in the liver cells may be affected by certain enzymes in individuals suffering from diabetes mellitus which may lead to increase glucose levels in the blood.

Anti hypertensive: The EGCG has a multitude of effects on the blood vessels, heart and other associated factors that control the blood pressure in our body. It has also been proposed that green tea catechins are responsible for lowering the blood pressure in certain instances.

Antioxidant activity: Green tea polyphenols exert antioxidant action by various mechanisms, which include iron chelation resulting in scavenging of free radicals, prevention of B-amyloid formation, prevention of oxidation stress induced brain cell death by inducing the neurons to lower production of caspase 3. In lab tests, EGCG, found in green tea, was found to prevent HIV from attacking T-Cells. However, it is not yet known if this has any effect on humans.[5]

An antioxidant in green tea may block HIV, the virus that causes AIDS, from attaching to an important molecule on immune system cells. epigallocatechin gallate (EGCG), a chemical found in green tea, might block HIV from attaching to the immune system's T-helper cells, thus protecting those T cells from HIV's damage. T-helper cells act as a "general" in directing and activating other immune cells in the fight against HIV.

PRECAUTION [21]

In Anemic: Due to high tannin content, green tea prevents iron absorption.

In Expecting mothers: High amount of EGCG acts like the anticancer drugs, which inhibit dihydrofolate enzyme which the cancer cells utilize to grow & proliferate. The embryo utilizes the same enzyme for cell proliferation and differentiation.

CONCLUSION

Green tea has gained popularity over the conventional black tea in the past few years, attributed to its miraculous therapeutic and prophylactic action. It may be regarded as a food component useful for the maintenance of health. It affords protection against a wide range of diseases like atherosclerosis, diabetes, osteoporosis,

Parkinsonism and various cancers induced by chemical carcinogens that involve the lungs, fore stomach, esophagus, duodenum, pancreas, liver, breast, colon, and skin. Considering great healing potential of green tea, it won't be an exaggeration to say: three cups of green tea in a day keeps all disease at bay.

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