Research Paper

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A Concise Literary Review of Pharmacological Action of Green Tea

Medical Science

KEYWORDS : Green tea, Camellia sinensis, Polyphenol, Leaf.

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ABSTRACT

Tea is considered the most consumed beverage in the world behind water, however 78% of the tea consumed worldwide is black and only about 20% is green. All types of tea except herbal tea are brewed from the dried leaves of the Camellia sinensis bush. The level of oxidation of the leaves determines the type of tea. Green tea is made from un-oxidized leaves and is one of the less processed types of tea (with white tea the least) and therefore contains one of the most antioxidants and beneficial polyphenols. Green tea was used in traditional Chinese and Indian medicine to control bleeding and heal wounds, aid digestion, improve heart and mental health and regulate body temperature.4 Recent studies have shown green tea can potentially have positive effects on everything from weight loss to liver disorders to type 2 diabetes.

Introduction[1]:

Tea is the most consumed drink in the world after water. Green tea is a 'non-fermented' tea, and contains more catechins, than black tea or oolong tea. 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. 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.

Pharmacognosy[2]:

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 sinensis* and *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.

Green tea is made from unfermented leaves and reportedly contains the highest concentration of powerful antioxidants called polyphenols. Antioxidants are substances that scavenge free radicals -- damaging compounds in the body that alter cells, tamper with DNA (genetic material), and even cause cell death. Antioxidants such as polyphenols in green tea can neutralize free radicals and may reduce or even help prevent some of the damage they cause.

Scientific Classification and Pharmacodynamics[3]:

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

Binomial name : *Camellia sinensis* (L.) Kuntze
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 doshaghnata as kapha pitta hara, kinchit vata prakopaka

Chemical Composition and Constituents[4]:

According to scientist Graham Harold, dried tea extract can contain 30% to 40% of catechins. The four main catechins are: Epicatechin , Epicatechin-3-gallate , Epigallocatechin and Epigallocatechin-3-gallate (also known as EGCG)

EGCG (Epigallocatechin-3-gallate)5:

The star of the show, of course, is EGCG. 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 resveratol.

Other Polyphenols:6

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:7

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:8

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:9
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.

Pharmacotherapeutics:10
Effect on Diabetes:
Hyperglycemia-induced oxidative stress in pancreatic β-cells plays a pivotal role in the development of diabetes . Some of the polyphenolic compounds protect β-cells from hyperglycemia-induced and oxidative-induced damage. oral administration of phenolic-rich chestnut extract in STZ-induced diabetic rats had favorable effects on serum glucose and viability of β-cell through attenuation of stress. Some polyphenols are able to regulate the key pathways of carbohydrate metabolism and hepatic glucose homeostasis including glycolysis, glycogenesis and gluconeogenesis, usually impaired in diabetes. Green tea polyphenols, mainly catechins and epicatechins have been shown to attenuate hyperglycemia and hepatic glucose output via downregulation the expression of liver glucokinase and up regulation of PEPCK ; in an *in vitro* study, epigallocatechingallate (EGCG), one of the most abundant catechins in green tea, could activate AMP-activated protein kinase as a required pathway for the inhibition of gluconeogenic enzymes expression . of metabolic changes in β-cells .

Weight loss:[11]
Clinical studies suggest that green tea extract may boost metabolism and help burn fat. One study confirmed that the combination of green tea and caffeine improved weight loss and maintenance in overweight and moderately obese individuals. Some researchers speculate that substances in green tea known as polyphenols, specifically the catechins, are responsible for the herb's fat-burning effect.

Dose & administration:12
Paediatric: There are no known scientific reports on the paediatric use of green tea, so it is not recommended for children.

Adult: Depending on the brand, 2 - 3 cups of green tea per day (for a total of 240 - 320 mg polyphenols) or 100 - 750 mg per day of standardized green tea extract is recommended. Caffeine-free products are available and recommended.

Precautions: People with heart problems, kidney disorders, stomach ulcers, and psychological disorders (particularly anxiety) should not take green tea. Pregnant and breast feeding women should also avoid green tea. People who drink excessive amounts of caffeine (including caffeine from green tea) for prolonged periods of time may experience irritability, insomnia, heart palpitations, and dizziness. Caffeine overdose can cause nausea, vomiting, diarrhea, headaches, and loss of appetite. If you are drinking a lot of tea and start to vomit or have abdominal spasms, you may have caffeine poisoning. If your symptoms are severe, lower your caffeine intake and see your health care provider.

Possible Interactions:13
If you are being treated with any of the following medications, you should not drink green tea or take green tea extract without first talking to your health care provider:

Adenosine -- Green tea may inhibit the actions of adenosine, a medication given in the hospital for an irregular (and usually unstable) heart rhythm.

Antibiotics, Beta-lactam -- Green tea may increase the effectiveness of beta-lactam antibiotics by reducing bacterial resistance to treatment.

Benzodiazepines -- Caffeine (including caffeine from green tea) has been shown to reduce the sedative effects of benzodiazepines (medications commonly used to treat anxiety, such as diazepam and lorazepam).

Beta-blockers, Propranolol, and Metoprolol -- Caffeine (including caffeine from green tea) may increase blood pressure in people taking propranolol and metoprolol (medications used to treat high blood pressure and heart disease).

Blood Thinning Medications (Including Aspirin) -- People who take warfarin, a blood thinning medication, should not drink green tea. Since green tea contains vitamin K, it can make warfarin ineffective. Meanwhile, you should not mix green tea and aspirin because they both prevent platelets from clotting. Using the two together may increase your risk of bleeding.

Chemotherapy:14 The combination of green tea and chemotherapy medications, specifically doxorubicin and tamoxifen, increased the effectiveness of these medications in laboratory tests. However, these results have not yet been demonstrated in studies on people. On the other hand, there have been reports of both green and black tea extracts stimulating a gene in prostate cancer cells that may cause them to be less sensitive to chemotherapy drugs. Given this potential interaction, people should not drink black and green tea (as well as extracts of these teas) while receiving chemotherapy for prostate cancer in particular.

Clozapine -- The antipsychotic effects of the medication clozapine may be reduced if taken fewer than 40 minutes after drinking green tea.

Ephedrine -- When taken together w ith ephedrine, green tea may cause agitation, tremors, insomnia, and weight loss.

Lithium -- Green tea has been shown to reduce blood levels of lithium (a medication used to treat manic/depression).

Monoamine Oxidase Inhibitors (MAOIs) -- Green tea may cause a severe increase in blood pressure (called a "hypertensive crisis") when taken together with MAOIs, which are used to treat depression. Examples of MAOIs include phenelzine and tranylcypromine.

Oral Contraceptives:15 Oral contraceptives can prolong the amount of time caffeine stays in the body and may increase its stimulating effects.

Phenylpropanolamine:16 A combination of caffeine (including caffeine from green tea) and phenylpropanolamine (an ingredient used in many over-the-counter and prescription cough and cold medications and weight loss products) can cause mania and a severe increase in blood pressure. The FDA issued a public health advisory in November 2000 to warn people of the risk of bleeding in the brain from use of this medication and has strongly urged all manufacturers of this drug has been to remove it from the market.

Conclusion:
Green tea used traditionally to control blood sugar in the body. As explained by the Acharya Bapalal Vyadya in his Nighantu Adarsha, the Guna Karmas like Grahi, Mridu Uttejaka, Swedala, Mutrala and Nidra Nashaka are aptly suiting for its action on

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Sthula Madhumehi. The Kleda Vahana occurs through the Mutrala action in this Kleda Pradhana Vyadhi. The Uttejana Karma helps in the Sthoulya patient as Alasya and Asya Sukha is one of the prime cause and also a symptoms in sthoulya vyadhi. The Nidra nashaka Guna of this drug takes care of the Atinidrata or Diwaswapna which is one of the highlighted cause in the prameha as Swapna Sukha. Being a Medo pradoshaja vikara and as sweda is the mala of medas the Swedala action of this drug further slows down this disease pathogenesis. Thus this drug can be considered as a most ideal drug of choice with its multi-targeted action in this complicated sthula madhumeha vyadhi. By reviewing into literature & various organoleptic and physico-chemical properties of the green tea, the following possible rasa panchaka reminants are postulated. Vipaaka: Katu and Prabhava: Vayasthapana, Rasayana, Medohara and Pramehaghna.

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