The effect of tea consumption on blood pressure , total cholesterol , body weight and fat in healthy volunteers .

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اشراف الدكتور : يوسف نعيم

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Introduction

Tea is the second most extensively consumed beverage in the world has a slightly cooling, astringent flavor .The drink is prepared from the evergreen perennial shrub called Camellia sinensis (L.). The tender leaves are processed to make a drink that gives people the crucial pep and stimulus necessary for doing mental and physical work .

China was the first country to use tea as a medicine and drink , and plants that are more than 1,500 years old are still blooming in the Yunnan province of southwestern China. Under normal conditions, tea plants can grow as high as 20–30 m. In the tropics, harvest of the apical bud and the young leaves continued throughout the year, but in temperate environments, plucking is done seasonally .

There are diverse kinds and qualities of products generated from different cultivation practices, growing conditions, and processing methods. It is principally consumed as fermented tea or black tea. tea has considerable therapeutic value and can cure many diseases, including cancer.

While green tea is known for its antioxidant properties, black tea is valued for its positive role in cardiovascular ailments. Black tea, green tea, yellow tea, oolong tea, white tea, and these are diverse varieties that all originate from the plucked leaves of C. sinensis, but disparities in processing determine which one is produced. After a tea is processed into any one of the five basic types, it can also be blended, flavored, or scented

Scientific Classification

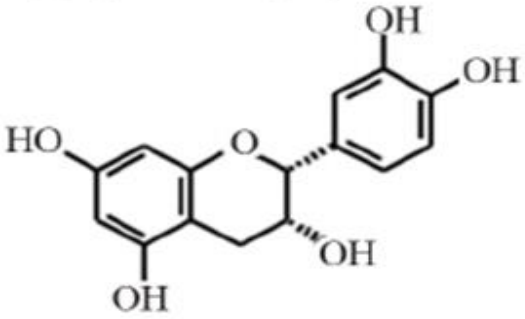
kingdom : Plantae
Order : Ericales
Family : Theaceae
Genus : Camellia
Species : C. sinensis
Binomial name : Camellia sinensis (L.) Kuntze
Scientific name: Camellia sinensis
Common name: Tea, tea bush, cha, chai
Leaves: Bright green and shiny
Flowers: Scented, occurring singly or in clusters of two to four
Fruits: Brownish-green, containing one to four spherical or flattened seeds
Origin: Native to East, South and Southeast Asia, but it is today cultivated across the world in tropical and subtropical regions

Botany of Major Tea Varieties

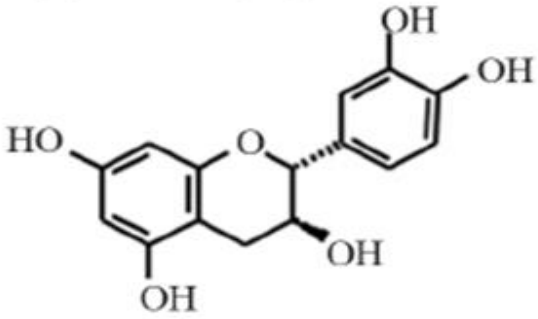
Tea plants belong to the family Theaceae. The cultivated varieties are hybrids of C. sinensis and Camellia assamica. Leaf size, flowers, and branching are considered the major taxonomic criteria for tea plants. For instance, Assam types are characterized by large leaves, whereas China types are characterized by very small leaves and Cambod leaves are between the two .The C. sinensis variety (the China type) can withstand low moisture, stress, and frost. These plants grow in big shrubs, with thick, hard, leathery leaves. The young leaves are erect and purple. On the other hand, C. assamica (Masters), the Assam type, is a small tree with robust branches and thin, glossy leaves. The tropical variety of C. assamica is sensitive to drought and cold. Cambodiensis tea, Camellia assamica sub sp. lasiocalyxis a small, fastigiated tree with many upright branches and erect, glossy, light green leaves whose petioles turn pinkish red upon maturity .

Chemical Constituents

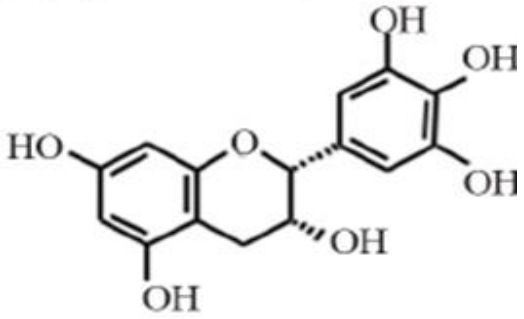
(−)-epicatechin (EC)



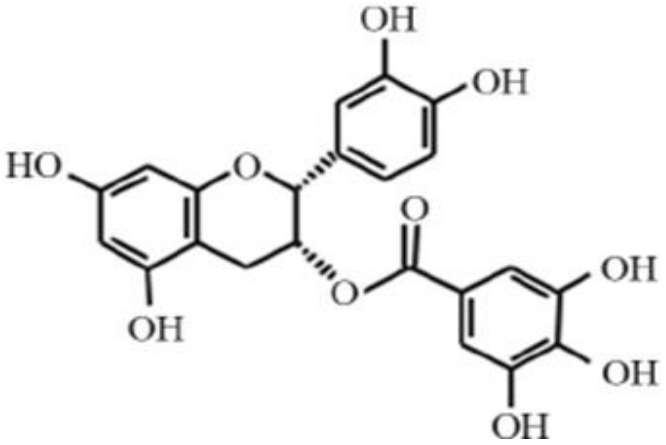
(+)-catechin (CT)



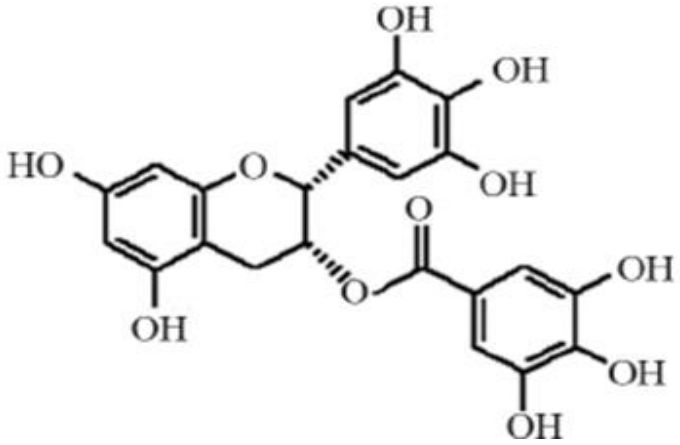
(−)-epigallocatechin (EGC)



(−)-epicatechin gallate (EGC)



(−)-epigallocatechin gallate (EGCG)



Tea is reported to contain nearly 4000 bioactive compounds of which one third is contributed by polyphenols . Other compounds are alkaloids (caffeine, amino acids, carbohydrates, proteins, chlorophyll, volatile organic compounds (chemicals that readily produce vapors and contribute to the odor of tea), fluoride, aluminum, minerals and trace elements .

Polyphenols found in tea are mostly flavonoids .The polyphenols, a large group of plant chemicals that includes the catechins, are thought to be responsible for the health benefits that have traditionally been attributed to tea, especially green tea . Major catechins are (-)-epicatechin gallate (ECG), (-)-epicatechin (EC), (-)epigallocatechin gallate -(EGCG) (Figure 2). The most active and abundant catechin in green tea is epigallocatechin-3-gallate (EGCG).

Black tea contains much lower concentrations of these catechins than green tea .

*__Tannins__ are present in naturally occurring substances and organic matter, including leaves and wood. It is used in the tanning of leather, hence the name. Tannins in tea, give the

beverage its astringency.

Teas with a high level of tannin have a bitter taste accompanied by strong astringency, seen especially in green and black tea. The tannins found in tea are thearubigins, most prominently theaflavins. When the anti-oxidising agents such as catechin in the tea become oxidised, theaflavins are

produced.

Tannins in tea are responsible for the antioxidant activities of black and other dark teas. They have both positive and negative effects on the body. The positive health benefits of tannin come from its anti-carcinogenic and anti-mutagenic properties, mostly due to its anti-oxidising nature.

Tannins also remove harmful microbes from the body, and fight against harmful bacteria, viruses and fungi. By speeding up blood clotting, tannins also have a healing effect on cuts and wounds. Other beneficial properties of tannins include stabilizing blood pressure.

The good and the bad

Although largely useful to the body, tannins also have negative effects. They are often anti-nutritional and can hinder digestion and metabolism, unlike polyphenols. Tannins can also help obstruct the blood's absorption of iron, which may lead to a multitude of health problems.

Growing and harvesting of tea

Throughout history, there have been various methods of tea growing and harvesting. Nowadays, in light of modern scientific evidences and the complexities of tea, its cultivation and harvesting have more or less been standardized across the world.

The growth cycle is from 240 to 365 days, fruits takes from 270 to 360 days to mature and seeds are normally produced after 3 years.

The young plants that have been carefully nurtured in nurseries for up to a year are re-planted in especially prepared fields following the natural reliefs of the land, or sometimes, on specially prepared terraces to help irrigation and to prevent erosion.

The plants are planted 3 to 5 feet (1 to 1.5 meters) apart. It takes approximately two to three years, depending on the elevation and climatic conditions, before these plants are ready to produce tea .

Pruning

When the young plant develops to a height of about half a meter above ground level, it is cut back to within a few inches off the ground to develop it into a flat-topped bush. Once fully developed, a tea bush is approximately 3 ½ feet (1 m) in height, and continues to be pruned in cycles of 1-2 years at low altitude and 3-5 years at higher altitudes. The timing of pruning also dependent on the rainfall, as sufficient moisture in the soil is required

Plucking or Picking

10 kg of green bushes produce about 2.5 kg of dried tea. Quality and biochemical constituents of tea leaves depends on the method of harvesting. Tea-plucking is done manually (hand-plucking) or with machine (automated picking). However, hand-plucking remains the best method of tea harvesting. Automated picking is a non-selective process, which can damage the leaves and affect the quality .

Tea Processing

As soon as the newly picked leaves reach the factory, processing begins. Tea processing is the method in which the leaves from the tea plant are transformed into the dried leaves for brewing tea. The categories of tea are distinguished by the processing they undergo. Tea processing involves different manners and degree of oxidation of the leaves, ending the oxidation, forming the tea and drying it .

Tea processing for all tea types consists of very similar traditional methods with only minor variations. The main different steps are the following :

The whitening

Tea leaves begin to wilt soon after plucking, with a gradual beginning of enzymatic oxidation. This process is called withering, and is used to eliminate excess water from the leaves and allow slight oxidation. Cold or warm air is blown through the leaf for 12 to 18 hours .

Maceration:

Teas are bruised or torn in order to promote and accelerate oxidation. The bruising breaks down the structures inside and outside of the leaf cells and allows, from the co-mingling of oxidative enzymes with various substrates, which allows the beginning of oxidation .

Fermentation:

Macerated leaf is held in a climate-controlled room (warm, humid) for up to few hours .

Fixation:

This step is done to stop the tea leaf oxidation at a desired level. This process is accomplished by moderately heating tea leaves, therefore deactivating their oxidative enzymes and removing undesirable scents in the leaves, without damaging the flavour of the tea .

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Rolling or Shaping:

The rolling action gives the leaves a curled appearance and further improves the taste of the tea

Drying:

Fermented leaf is dried in a current of hot air, which stops the fermentation and reduces the moisture content .

Curing or Aging:

Secondary fermentation, or baking, is done to reach the drinking potential. Flavored teas are manufactured in this stage by spraying the tea with aromas and flavors or by storing them with

Flavorings

Grading:

The dry leaves are size graded and separated, large from small and broken from unbroken leaves. This classification gives grades to tea leaves .

Types of tea

Six types of tea

1.White tea :

White tea undergoes the least processing of all teas. Traditionally cultivated in China, white tea was picked only a few days out of the year, when a white down, known as bai hao, appeared on the tender shoots.

2.Green tea :

Because they are unoxidized, green teas keep their vital color. To prevent oxidization, the leaves are heat processed to eliminate the enzyme responsible for oxidization.

3. Oolong tea :

Oolong, also spelled Wu Long, teas are semi-oxidized. The term in Chinese actually means "Black Dragon". Oolong teas have long been cultivated in both mainland China and Taiwan. In general, larger, mature leaves are picked, rolled and OXIDIZIED .

4. Black tea :

Black tea is the most well-known variety of tea in the West. Known as "red tea" in China, black tea leaves are fully oxidized. The use of machines is becoming more common, but the best black teas are those entirely done by hand. Machine-processed teas tend to be of lower quality and are generally used in tea bags .

Tea grading

At the end of the manufacturing process, tea consists of a mixture of different sized pieces of leaf. The harvesting and manufacturing of tea has a great impact on the finished size of the leaf, thus the tea grade. In order to ensure an even brew, these particles must be sorted into different grades (or sizes). These grades are not standardised worldwide and may vary according to origin

Most black teas are graded and sold according to leaf or particle size .

Black tea grading

The classification is done by hand or by passing the leaves though sifters with graduated mesh sizes to separate them out. The resulting piles of tea are then classified according to size, type and appearance .

The method given by the International Standard Organization provides a classification of tea according to their particle size distributions.

Broken leaf tea

Broken-leaf tea is tea that has been torn or broken, but is still in large enough pieces to be recognizable as pieces of leaf .

Fannings

They are finely-broken pieces of tea leaf. They have a recognizable coarse texture and are the grade of tea used in most tea bags .

Dust

Tea made by pulverizing larger pieces of leaf. Dust is a much finer powder than fanning's .

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Grading by elevation

Because altitude affects the growth, chemistry and flavour of the leaf, altitude can also be an indicator of taste and quality and can be distinguished by the altitudes at which it is grown .

Uses

The tea extracts are used in several areas of beverage industry. However, besides its main function as a beverage, tea has various special uses.

Pharmacological and Beneficial Effects of Green Tea

A good number of animal and clinical studies suggest that

chemical constituents in tea play an important role in contributing overall human health. The health benefits derived through the consumption

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 .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 radicles 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 reductdase, and quinine reductdase in small intestine, liver and lungs. The antioxidant properties of tea may prevent atherosclerosis (i.e.,

thickening or loss of elasticity of arteries), particularly coronary artery disease (Miura, Chiba, & Tomita, 2001).

Fights against variable forms of cancer

Green tea contain various antioxidants and phenolic compound some of which have been shown to have anti-cancer properties population-based studies confirm about the cancer protective effects of tea (Vasisht et al., 2003). Polyphenols present in tea being powerful antioxidants, may play an important role in the prevention of cancer by reducing damage of DNA in the cell and activation of cancer leading to malignancy. Table 2a and b will present the effect of consumption of tea on combating different types of cancer based on different survey by different researchers .

Drinking green tea is associated with decreased frequency of cancer development .

Effect of consumption of tea on combating different types of cancer

Type of cancer	Effect of consumption of tea
Colorectal cancer	Studies on the effects of green tea on colon or rectal cancer have produced conflicting results. Some studies show decreased risk in those who drink the tea, while others show increased risk. So, further research is needed before any recommendation
Stomach cancer	In two studies that compared green tea drinkers with non-drinkers, researchers found that people who drank tea were about half as likely to develop stomach cancer and gastritis (inflammation of the stomach) as those who did not drink green tea. However, a recent study in Japan found no association between green tea consumption and stomach cancer risk. Further research in this line can only confirm whether green tea reduces the likelihood of developing this disease
Urinary bladder cancer	In one study that compared people with and without bladder cancer, researchers found that women who drank black tea and powdered green tea were less likely to develop the disease. A follow-up study by the same group of researchers revealed that bladder cancer patients (particularly men) who drank green tea had a substantially better five-year survival rate than those who did not
Skin cancer	Scientific studies suggest that epigallocatechin gallate (EGCG), the major tea polyphenol along with other polyphenols have anti-inflammatory and anti-cancer properties that may help prevent the onset and growth of skin tumours
Cancer due to smoking	Cancer is usually caused by oxidative damage resulting from cigarette smoking. Researchers claim that tea polyphenols are powerful anti-oxidants and induce phase-2 detoxification enzymes, resulting in the body's ability to quench more oxidative DNA damage which in turn reduces the risk of cancer

Effects on Cholesterol

Green tea helps to lower LDL cholesterol levels and boost high-density lipoprotein. Referred to as HDL for short, or “good” cholesterol, high-density lipoprotein sweeps bad cholesterol away from the arteries, preventing atherosclerosis. The clogged arteries that result from atherosclerosis can lead to heart attack or stroke.

Evidence

The first human study to show that green tea reduced LDL cholesterol was conducted by Vanderbilt University Medical Center in 2003. During a 12-week trial, study participants took 375 mg capsules containing an extract of green tea. The levels of polyphenols in the capsules were equivalent to the amount found in 35 cups of green tea. Supplementation with the green tea resulted in a 16 percent reduction in cholesterol -- an effectiveness that surprised the researchers.

Dosage

The University of Maryland Medical Center recommends drinking two to three cups of green tea per day. This amount contains about 240 to 320 mg of polyphenols. If you take a green tea supplement, such as a liquid extract or pill, try to stay within these recommended intakes for polyphenols.

Treat respiratory diseases

Theophylline in tea is used to prevent respiratory diseases like wheezing, shortness of breath, and difficulty breathing caused by asthma, chronic bronchitis, emphysema, and other lung diseases .

It relaxes and opens air passages in the lungs, making it easier to breathe.

Corrects skin disorder

Tannins and flavonoids of tea are having with the antiseptic properties. The former also have anti-inflammatory effects.

Green tea also has some benefits for the body if used externally It can be used to stop or slow bleeding, and can relieve itchy rashes and bug bites. Also, many hair and skin care products make use of tea tree oil to add shine and replenish. Researchers are also looking into green tea as a natural sun block .

Green tea constituents may be useful topically for promoting skin regeneration, wound healing, or treatment of certain epithelial conditions such as aphthous ulcers and psoriasis. At certain concentrations, EGCG or a mixture of the major green tea polyphenols stimulated aged keratinocytes to generate biological energy and to synthesize DNA, possibly for renewed cell division (Hsu et al., 2003) .

Aids in indigestion

Because green tea contains astringent tannin compounds, it

can ease indigestion, diarrhea, and other forms of gastrointestinal

dysfunction . Moreover, all type of tea having antibacterial,antioxidant, antiseptic and detoxifying properties are very much effective in treating infectious dysentery as well as easing IBD. This makes tea useful as a traditional home remedy for various digestive problems .

Prevents diabetes

Animal studies revealed that green tea may have properties to prevent development of Type 1 diabetes and slow the progression once it has developed. Insulin causes most of the body cells to take up glucose from the blood, storing it as glycogen in the liver and

muscle, and stops use of fat as an energy source. When insulin is

absent or low, glucose is not taken up by most body cells and the

body begins to use fat as an energy source. People with Type 1 diabetes

produce little or no insulin, a hormone that converts glucose

(sugar), starches and other foods into energy needed for daily life .Tea polyphenols lower the serum glucose by inhibiting the activity

of the starch digesting enzyme, amylase. Tea inhibits both salivary

and intestinal amylase. As a result, the starch is broken down more

slowly and the sudden rise in serum glucose is minimized. The

inhibition of a-amylase from human saliva by polyphenolic components

of tea.

Type 2 diabetes mellitus is a common disease that interferes with the body's ability to store energy from food. Risk factors for type 2 diabetes mellitus include being overweight, lack of exercise, and family history of the disease. Iso, Date, Wakai, Fukui, and Tamakoshi (2006) opined from a study that people who were frequent drinkers of green tea (>6 cups per day) were less likely to develop this diabetes than those who drank less than one cup of these beverages per week .

Caffeine is a mild stimulant consisting of a xanthine molecule with three methyl groups attached to it is predominantly found in the leaves of tea. It enters the body and forces the working muscles to utilize as much fat as possible. This delays the immediate depletion of glycogen. When this happens, the saved glycogen can be used for the remainder of the workout where normally it would be entirely depleted.

Keeps away from liver disease

Green tea protects the liver from alcohol and other harmful chemicals. Alcohol metabolism results in the production of damaging free radicals that can overwhelm the liver's supply of antioxidants ,

resulting in liver injury.

Gives a boost to immunity

Green tea carry micronutrients that feed the human immune system and strengthen body cells. When the immune system becomes stronger, tissue and cell repair is enhanced in a way that the body retains the ability to heal itself

Pharmacological activity of black tea :

The Effect of Black Tea on Weight Loss

*Research published so far suggests that black tea has the potential to support weight loss. The digestive enzyme lipase is inhibited in laboratory animals that consume black tea flavonoids. Since fats aren't digested without lipase, some dietary fats are eliminated from the body rather than absorbed. When lab mice were fed a high-fat diet, the animals receiving a higher dose of black tea polyphenols lost more weight than the group that got fewer polyphenols, reported Nutrition in 2011.

*Researchers also reported that energy expenditure -- or calories burned -- significantly increased after laboratory mice received a dose of theaflavins from black tea, according to PLoS One in September 2015. The studies published so far are promising, but they've only used lab animals. More research is needed in people to determine black tea's impact on weight loss.

*Caffeine Boosts Metabolism to Lose Weight

Diuretic Effects

Caffeine is also a diuretic, a substance that stimulates you to urinate more often and in greater amounts. This can lead to water weight loss, which makes a difference on your bathroom scale.

Mental alertness

Drinking black tea and other caffeinated beverages throughout the day helps to keep people alert, even after extended periods without sleep .

Low blood pressure after eating (postprandial hypotension)

Drinking beverages containing caffeine, such as black tea, helps increase blood pressure in older people who have low blood pressure after eating .

Kidney stones

Women who drink black tea seem to have an 8% lower risk of developing kidney stones .

Heart attacks

Some research shows that people who drink black tea have a lower risk of having a heart attack. Also, people who have been drinking black tea for at least a year before having a heart attack seem to be less likely to die after having a heart attack .

Brittle bones (osteoporosis)

Early research shows that older women who drink more black tea seem to have stronger bones. Drinking more black tea also seems to be linked with a lower risk of hip fracture in older men and women .

Ovarian cancer

Women who regularly drink tea, including black tea or green tea, appear to have a lower risk of developing ovarian cancer compared to women who never or rarely drink tea .

Parkinson's disease

Some research shows that people who drink caffeinated beverages such as coffee, tea, and cola have a lower risk of Parkinson's disease. The lower risk seems to be directly related to the dose of caffeine in men but not women. Drinking black tea also appears to be linked with a reduced risk of Parkinson's disease among people who smoke cigarettes .

Possibly Ineffective for :

High blood pressure:

Some early research suggests that people who regularly drink green or black tea have a lower risk of having high systolic blood pressure, which is the top number of a blood pressure reading. However, most research shows that drinking black tea does not reduce blood pressure in people with normal or high blood pressure .

Breast cancer

Colon and rectal cancer

Diabetes

Stomach cancer

Interactions

Moderate Interaction

Be cautious with this combination

Adenosine (Adenocard) interacts with BLACK TEA-

Black tea contains caffeine. The caffeine in black tea might block the affects of adenosine (Adenocard).

Antibiotics (Quinolone antibiotics) interacts with BLACK TEA-

The body breaks down caffeine to get rid of it. Some antibiotics might decrease how quickly the body breaks down caffeine. Taking these antibiotics along with black tea can increase the risk of side effects including jitteriness, headache, increased heart rate, and other side effects

Cimetidine (Tagamet) interacts with BLACK TEA

Black tea contains caffeine. The body breaks down caffeine to get rid of it. Cimetidine (Tagamet) can decrease how quickly your body breaks down caffeine .

-Dipyridamole (Persantine) interacts with BLACK TEA

Black tea contains caffeine. The caffeine in black tea might block the affects of dipyridamole (Persantine). Dipyridamole (Persantine) is often used by doctors to do a test on the heart. This test is called a cardiac stress test. Stop drinking black tea or other caffeine containing products at least 24 hours before a cardiac stress test .

Side Effects & Safety

Drinking moderate amounts of black tea is LIKELY SAFE for most adults .

Drinking too much black tea, such as more than five cups per day, is POSSIBLY UNSAFE. High amounts of black tea can cause side effects due to the caffeine in black tea. These side effects can range from mild to serious and include headache, nervousness, sleep problems, vomiting, diarrhea, irritability, irregular heartbeat, tremor, heartburn, dizziness, ringing in the ears, convulsions, and confusion. Also, people who drink black tea or other caffeinated beverages all the time, especially in large amounts, can develop psychological dependence .

Drinking very high amounts of black tea containing more than 10 grams of caffeine is LIKELY UNSAFE. Doses of black tea this high might cause death or other severe side effects .

Caffeine is PROBABLY SAFE in children in amounts commonly found in foods

Special Precautions & Warnings :

Children: Black tea is POSSIBLY SAFE when taken by mouth by children in amounts commonly found in foods .

Pregnancy and breast-feeding: If you are pregnant or breast-feeding, drinking black tea in small amounts is POSSIBLY SAFE. Do not drink more than 3 cups a day of black tea. This amount of tea provides about 200 mg of caffeine. Consuming more than this amount during pregnancy is POSSIBLY UNSAFE and has been linked to an increased risk of miscarriage, increased risk of sudden infant death syndrome (SIDS), and other negative effects, including symptoms of caffeine withdrawal in newborns and lower birth weight.

If you are breast-feeding, drinking more than 3 cups a day of black tea is POSSIBLY UNSAFE and might cause your baby to become more irritable and have more bowel movements .

Anemia: Drinking black tea may make anemia worse in people with iron deficiency .

Anxiety disorders: The caffeine in black tea might make these conditions worse

Bleeding disorders: There is some reason to believe that the caffeine in black tea might slow blood clotting, though this hasn’t been shown in people. Use caffeine cautiously if you have a bleeding disorder

Heart problems: Caffeine in black tea can cause irregular heartbeat in certain people. If you have a heart condition, use caffeine with caution .

Diabetes: The caffeine in black tea might affect blood sugar. Use black tea with caution if you have diabetes

Diarrhea: Black tea contains caffeine. The caffeine in black tea, especially when taken in large amounts, can worsen diarrhea .

Glaucoma: Drinking caffeinated black tea increases the pressure inside the eye. The increase occurs within 30 minutes and lasts for at least 90 minutes .

Conclusion

Tea is a perennial, nonalcoholic beverage crop that is vital to the world. It is an employment-generating, labor-intensive, ecofriendly, and sustainable agricultural product that brings in income from export for tea-producing countries. It also supports several ancillary industries that further improve people's livehoods. It also has several medicinal benefits, and it is taken as a morning drink by nearly half of the world's people. In addition to black tea, several other forms of tea are available today due to its product diversification. Manufacturing processes, though, varied depending upon the type of tea, and this point has been well studied. Horticultural practices such as pruning, plucking, agronomical practices such as manuring are well established .

Although conventional breeding is the backbone for varietal improvement of tea, it is extremely slow. Biotechnological practices area potential alternative, but successes are limited due to several factors, such as poor response in tissue culture and long life cycle. However, the tea industry has a high impact on the environment. While being monoculture, it is hub a particular type of fauna, it is ecologically friendly, that is, not harmful to the environment, absorbs greenhouse gases, and supports tea-tourism. However, it also raises certain concerns, including the huge use of pesticides and irrational use of chemical fertilizers .


Thank
you