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Review

Ginger (*Zingiber officinale*): A review

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Ginger is used worldwide as a cooking spice, condiment and herbal remedy. Ginger is used extensively in Ayurveda, the traditional medicine of India to block excessive clotting (that is, heart disease), reduce cholesterol and fight arthritis. In Arabian medicine, ginger is considered an aphrodisiac. The Eclectic physicians of the 19th century relied on ginger to induce sweating, improve the appetite and curb nausea, and as a topical counterirritant. Nowadays, ginger is extensively cultivated from Asia to Africa and the Caribbean, and is used worldwide as a nausea remedy, as an anti-spasmodic and to promote warming in case of chills as presented in this report. Ginger is also extensively consumed as a flavoring agent; it is estimated that in India, the average daily consumption is 8 to 10 g of fresh ginger root. Moreover, the German Commission E has approved the use of ginger root as a treatment for dyspepsia and prophylactic against motion sickness.

Key words: Ginger, *Zingiber officinale*, traditional usages.

INTRODUCTION

Ginger is primarily used to treat nausea, but it is also used as an anti-inflammatory, a pain remedy, a warming remedy and a cholesterol-lowering herb. Randomized controlled trials support its use in preventing nausea. Case studies suggest usefulness in treating migraines and inflammatory arthritis, but no randomized trials have been reported. Animal studies suggest thermogenic effects, but this has not been evaluated in humans. Moreover, data are insufficient to recommend ginger as a cholesterol-lowering supplement. Given its long history of use as a food, ginger is presumed safe for supplemental use. Due of its effects on platelet aggregation and thromboxane synthesis *in vitro*, some herbalists suggest caution for patients taking anticoagulants or those scheduled for surgery; on the other hand, no clinically significant anticoagulant effects have been documented. It is on the Generally Recognized as Safe (GRAS) list, but no studies have specifically evaluated ginger's safety during pregnancy, lactation or during childhood. A related species has uterotonic effects in animals, which has led some herbalists and the German Commission E to recommend that ginger be avoided during pregnancy.

Ginger is used worldwide as a cooking spice, condiment and herbal remedy. The Chinese have used ginger for at least 2500 years as a digestive aid and antinausea remedy, and to treat bleeding disorders and rheumatism; it was also used to treat baldness, toothache, snakebite, and respiratory conditions (Duke and Ayensu, 1985). In Traditional Chinese Medicine (TCM), ginger is considered a pungent, dry, warming, yang herb to be used for ailments triggered by cold, damp weather. Ginger is used extensively in Ayurveda, the traditional medicine of India, to block excessive clotting (heart disease), reduce cholesterol and fight arthritis. In Malaysia and Indonesia, ginger soup is given to new mothers for 30 days after their delivery to help warm them and to help them sweat out impurities. In Arabian medicine, ginger is considered an aphrodisiac (Qureshi et al., 1989). Some Africans believe that eating ginger regularly will help repel mosquitos (Duke and Ayensu, 1985).

Ginger migrated westward to Europe by Greek and Roman times. The Greeks wrapped ginger in bread and ate it after meals as a digestive aid. Subsequently, ginger was incorporated directly into bread and confections such

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as gingerbread. Ginger was so valued by the Spanish that they established ginger plantations in Jamaica in the 1600's. The Eclectic physicians of the 19th century relied on ginger to induce sweating, improve the appetite and curb nausea, and as a topical counterirritant. Nowadays, ginger is extensively cultivated from Asia to Africa and the Caribbean and is used worldwide as a nausea remedy, as an anti-spasmodic and to promote warming in case of chills (Kapil et al., 1990; Johri and Zutshi, 1992). Ginger is also extensively consumed as a flavoring agent; it is estimated that in India, the average daily consumption is 8 -10 g of fresh ginger root (Murray, 1995). The German Commission E has also approved the use of ginger root as a treatment for dyspepsia and prophylactic against motionsickness (Blumenthal, 1998).

BOTANICAL DESCRIPTION

Ginger is a species included in the Zingiberaceae family. This family covers up to 24 genus and around 300 species. The genus *Zingiber* has about 20 species as well. Ginger plant possesses perennial tuberous or rhizomatous roots. The plant generates an upright, annual stalk (pseudo-stem), 60 to 90 cm tall, with dark green leaves. Its stalks are covered with flat sheaths that may be taken off stalk; 8 - 12 distiches leaves are present on the stem. The leaves are with long blades, or flat and stalk less blades; are alternative (alternate), lance late, linear lance late, specula, 10 to 21 cm tall and 2 to 2.5 cm wide. The glomerule singly rises from the stem on a small stalk. Ground clearance of the glomerule is 12 to 30 cm; it is shaped as a head surrounded by blades. The last blade is separated incrementally. The glomerule is more or less thumb-sized. The flowers are tiny and pale yellow in color. The anthers are double, coronate long, thin arenaceous channeled and horn-shaped. The ovary is oval and three-celled, each of which contains lots of eggs as well as filament-shaped, stigma funnel-shaped, peripheral hairy anthers with horn-shaped anthers right under the apex. The plant is widely cultivated all over India, Bangladesh, Taiwan, Jamaica and Nigeria. This perennial grows in warm climates (Schauenberg and Paris, 1977).

CHEMICAL COMPOSITION

The active ingredients in ginger are thought to reside in its volatile oils, which comprise approximately 1 - 3% of its weight. The major active ingredients in ginger oil are the sesquiterpenes: bisapolene, zingiberene, and zingiberol (Connell and Sutherland, 1969; Yoshikawa et al., 1993). The concentrations of active ingredients vary with growing conditions. Ginger's active ingredients have a variety of physiologic effects. For example, the gingerols have analgesic, sedative, antipyretic and antibacterial effects *in vitro* and in animals (Mascolo, 1989; Connell, 1970).

The characteristic odor and flavor of ginger is caused by a mixture of zingerone, shogaols and gingerols, volatile oils that composed one to 3% of the weight of fresh ginger. In laboratory animals, the gingerols increase the motility of the gastrointestinal tract and have analgesic, sedative, antipyretic and antibacterial properties. Ginger oil has been shown to prevent skin cancer in mice and a study at the University of Michigan demonstrated that gingerols can kill ovarian cancer cells. [6]-Gingerol (1-[4'-hydroxy-3'-methoxyphenyl]-5-hydroxy-3-decanone) is the major pungent principle of ginger. The chemopreventive potentials of [6]-gingerol present a promising future alternative to expensive and toxic therapeutic agents. Ginger contains up to 3% of a fragrant essential oil whose main constituents are sesquiterpenoids, with (-)-zingiberene as the main component. Smaller amounts of other sesquiterpenoids (β-sesquiphellandrene, bisabolene and farnesene) and a small monoterpenoid fraction (β-phelladrene, cineol, and citral) have also been identified. The pungent taste of ginger is due to nonvolatile phenylpropanoid-derived compounds, particularly gingerols and shogaols, which are formed from gingerols when ginger is dried or cooked. Zingerone is also produced from gingerols during this process; this compound is less pungent and has a spicy-sweet aroma. Ginger is also a minor chemical irritant, and because of this was used as a horse suppository by pre-World War I mounted regiments for feaguing. Ginger has a sialagogue action, stimulating the production of saliva, which makes swallowing easier.

AREAS OF USE

It has been used as a prominent spice and medicinal plant across the world since ancient times. The ginger we consume in fresh or dried from is *Rhizoma zingiberis* drug obtained from *Z. officinale* rhizomes. Ginger use is fairly high in USA, England and Scandinavian countries apart from the countries it is cultivated today. Some 2500 years ago, its forms of use in China included digestive aid, nausea remover, toothache reliever, bleeding regulator, rheumatic effective, remedy against baldness, anti-snakebite medicine and breathing regulator. Moreover, ginger bears a great significance in traditional Chinese medicine in our day, too. It occupies a large area of production and use in India as well. It has been used as an anticoagulant and cholesterol preventers, and remedy for arthritis in traditional Indian medicine. Its form of use in Arab culture is an aphrodisiac. Some Africans also believe that mosquitoes are repelled when they eat ginger on a regular basis. Epstein-Barr virus infection is among the reasons of cancer. It is reported that ginger inhibits this virus infection and thereby prevents cancer. Direct effect of ginger on humans is in the form of a

nausea reliever in the gastrointestinal system.

Traditional use

Ginger is carminative, pungent, stimulant, used widely for indigestion, stomachache, malaria and fevers. It is chiefly used to cure diseases due to morbidity of Kapha and Vata. Ginger with lime juice and rock salt increases appetite and stimulates the secretion of gastric juices. It is said to be used for abdominal pain, anorexia, arthritis, atonic dyspepsia, bleeding, cancer, chest congestion, chicken pox, cholera, chronic bronchitis, cold extremities, colic, colitis, common cold, cough, cystic fibrosis, diarrhoea, difficulty in breathing, dropsy, fever, flatulent, indigestion, disorders of gallbladder, hyperacidity, hypercholesterolemia, hyperglycemia, indigestion, morning sickness, nausea, rheumatism, sore throat, throat ache, stomach ache and vomiting. Ginger forms an important constituent of many pharmacopoeial Ayurvedic formulations (Misra, 1969; Nadakarni, 1993).

Anti-ulcer activity

In a previous study, ginger and 6-gingerol inhibited experimental gastric ulcers in rats (Yamahara, 1988; Al-Yahya, 1989). Fresh ginger decocted in water resulted in symptomatic improvement in 10 patients with peptic ulcers (Chang, 1987).

Anti-inflammatory activity

Ginger extract inhibited carrageenan-induced paw swelling and was as active as aspirin (Schauenberg and Paris, 1977). Essential oil of ginger inhibited chronic adjuvant arthritis in rats (Connell and Sutherland, 1969). Ginger and its pungent components are dual inhibitors of arachiodonic acid metabolism; that is, they inhibit both cyclooxygenase (prostaglandin synthetase) and lipoxygenase enzymes of the prostaglandin and leukotriene biosynthetic pathways (Mascolo et al., 1989; Flynn, 1986; Farnsworth, 1992).

Cardiovascular effects

Ginger exerted a powerful positive inotropic effect on isolated guinea pigs left atria (Connell, 1970). Gingerols were identified as the active components (Shoji, 1982; Kobayashi, 1988).

Antioxidant activity

Extracts of ginger have pronounced antioxidant activity comparable to that of synthetic antioxidant preservatives (Govindarajan, 1982).

FORMS OF USE

Ginger tea

In order to prepare ginger tea, a 2.5 cm tall fresh ginger root is sliced or used in powdered form. Next, half a dessertspoon of ginger refined using a grinder is added to a full glass of cold water, heated up to the boiling degree in a mild temperature, then boiled in a mild temperature for 5 to 6 min and drained. If necessary, a cup of freshly brewed tea is sweetened by squeezing juice of half a lemon and adding honey; and drinks it before it cools down. There is no inconvenience in drinking 1 or 2 cups of freshly brewed tea a day. The tea is preferred especially in complaints related to digestive system.

Tincture

You may prepare ginger tincture using a proper dilution. Primary areas of use are digestive problems, asthma and complaints related to urinary tract. Drink it continuously or when necessary by adding 10 to 15 drops into half a tablespoon of lukewarm water for 2 or 3 times a day.

Spice

Ginger is such a spice that patients suffering from stomach ulcer may use it conveniently. Spices containing ginger with may be conveniently added into soups, grilled meat with the purpose of easing digestion, any kind of cheese, vegetables, fruit salad, rice pilaf, muffins or cakes. Spices with ginger are preferred mostly due to their aphrodisiac effect.

WARNINGS

Ginger should not be used together with blood diluent medicines like heparin, warfarin and aspirin because bleeding time may be prolonged in long-term use of ginger, which is also a strong inhibitor of thromboxane synthetase. It does not bear any known side effect except for its long-term use during pregnancy period (it may be used for short terms against pregnancy nauseas).

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