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MEDICINAL PURPOSE OF GINGER (ZINGIBER OFFICINALE)

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ABSTRACT
The rhizome of Zingiber officinale (ginger) is widely utilized for medicinal purposes. Ginger, a natural remedy with medicinal properties, has been used for centuries for its anti-inflammatory, antioxidant, anti-nausea, and anti-cancer effects. It is used to alleviate nausea, reduce muscle pain, and improve heart health. Ginger's antimicrobial properties also reduce infection risk. Ginger tea is traditionally used to treat cough and sore throat. The study reveals ginger's efficacy in combating viral infections and reviving the body during disease conditions, enhancing appetite, immunity, and re-boosting weakened physiological functions. Ginger's active ingredients, including 6-gingerole, 6-shogaol, 6-paradol, zingerole, and zerumbone, enhance enzyme actions, balance circulation, and rejuvenate the body through physical re-strengthening. Further research on ginger's potential in various fields could lead to its use as a cost-effective, safe, and effective multipurpose medicinal agent. This review explores the potential health benefits of ginger, focusing on its phytochemical composition and physiological benefits like anticancer, anti-inflammatory, and antioxidant properties.
KEYWORD - *Ginger, Anti-inflammatory, Antioxidant, Antiviral, Pharmacological properties*

INTRODUCTION

Ginger is a perennial plant that grows up to three feet tall, with a stem 12 inches above ground and two-ranked leaves. It produces white and pink flower buds that bloom into yellow flowers. Ginger grows horizontally and laterally flattened with branching pieces, known as a rhizome. The rhizome has a firm texture and can be yellow, white, or red in color. Botanist William Roscoe (1753 - 1831) named the plant Zingiber, derived from Sanskrit word "singabera," meaning horn-shaped due to rhizome protrusions. The genus includes 85 aromatic herbs from East Asia and tropical Australia.[5] Ginger is a versatile herb used for various purposes, including treating nausea, anti-inflammatory, pain relief, warming, and cholesterol-lowering. Randomized controlled trials support its use in preventing nausea, while case studies suggest its potential for migraines and inflammatory arthritis.[2] Ginger is highly recommended in Ayurveda literature for various health benefits, including enhancing appetite, alleviating constipation, balancing circulation, cardio-protective properties, digestion enhancement, and improving voice. It also aids in coldness, pain management, and promoting proper circulation.[1] Ginger extract has been found to inhibit Helicobacter pylori growth in invitro studies, suggesting its potential use in treating G.I.T disorders.[3] Ginger, a spice, migrated westward to Europe during Greek and Roman times, where Greeks wrapped it in bread and consumed it as a digestive aid after meals.[2] Ginger powder's ethanolic extract inhibits Candida albicans and mastitis-causing bacteria in vitro studies, while also enhancing male reproductive functions and suggesting potential use as a fertility enhancer.[3] Ginger (Zingiber officinale Rosc.) is a nutritional plant used in medicine since ancient times to enhance food taste and flavor. It contains numerous bioactive compounds with biological and pharmaceutical effects, making it a popular choice for food enhancement and treatment. Ginger oil is utilized in various food products, including soft drinks, bakery items, confectionery, pickles, sauces, and preservatives, and comes in three forms: fresh root ginger, preserved ginger, and dried ginger.

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Fig 1: Zingeber Officinale Ginger Rhizome

Ginger extract has potential as an additive in the food and pharmaceutical industries, as traditional medicinal plants are cost-effective, locally available, and easily consumable.[11]

BOTANICAL DESCRIPTION

Zingiber officinale, also known as ginger, belongs to the Zingiberaceae family. The ginger plant has perennial tuberous or rhizomatous roots.[2] The plant produces an annual stalk, 60-90 cm tall, with dark green leaves. Its stalks are covered with flat sheaths and have 8-12 distiches leaves. The leaves have long blades, either alternate or flat, and are 10-21 cm tall and 2 to 2.5 cm wide. The glomerule rises from the stem on a small stalk, with a ground clearance of 12-30 cm and a head surrounded by blades.[2] The plant is extensively grown in India, Asia, Africa, Jamaica, Mexico, and Hawaii.

Chemical Composition

Ginger is a versatile spice with a rich nutritional profile, including 50% carbohydrates, 9% protein, 6-8% fatty acids, 3-6% ash, and 3-6% crude fiber. Ginger is a rich source of essential micronutrients like potassium, magnesium, copper, manganese, and silicon. Ginger rhizome contains a small amount of vitamins A, E, B-vitamins, and Vitamin C.[5] Ginger root contains essential oils, phenols, oleoresins, proteolytic enzymes, vitamins, and minerals, including zingiberene, camphene, cineole, bisabolene, phellandrene, citral, borneol, cittronellol, geraniol, linalool, limonene, and camphene.[3]

Traditional use

Ginger is a potent carminative and stimulant, commonly used for indigestion, stomachache, malaria, and fevers. It is primarily used to treat Kapha and Vata diseases. When combined with lime juice and rock salt, ginger increases appetite and stimulates gastric juice secretion. It is also used for abdominal pain, anorexia, arthritis, atonic dyspepsia, bleeding, cancer, chest congestion, chicken pox, cholera, chronic bronchitis, cold extremities, and more. Ginger is a key component of many Ayurvedic formulations.[2]

1) Traditional Chinese Medicine (TCM): Ginger is utilized in Traditional Chinese Medicine (TCM) to regulate body energy, promote warmth, stimulate appetite, and treat cold-related ailments.
2) Ayurveda: Ginger, a key ingredient in Ayurveda, is known for its digestive benefits, balance of the three doshas, overall vitality enhancement, and treatment of various ailments.

MEDICINAL PROPERTIES

Antiviral Effect

Some studies have indicated that ginger extracts can inhibit the replication of certain viruses. For example, research has shown that ginger may have activity against influenza viruses and may help reduce symptoms of viral infections. Z.officinale's fresh rhizome has been found to have antiviral properties against Human Respiratory Syncytial Virus (HRSV) infection by reducing plaque formation in respiratory mucosal cell lines.[1] The lyophilized juice extract of Z. officinale has been found to have antiviral effects against Hepatitis C viral infection. Studies have shown that it inhibits viral replication in Hep G2 cells by affecting viral RNA. Additionally, it has been found to decrease Hepatitis C virus loads, α-fetoprotein levels, and liver function markers in Egyptian HCV patients.[1] Z. officinale, rich in allicin, an active ingredient with anti-influenza cytokines, effectively acts as an antiviral agent against influenza A (H1N1).

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Anti-inflammatory Effect

Ginger is well-known for its anti-inflammatory properties, which are largely attributed to its bioactive compounds, such as gingerol, shogaol, and paradol. Ginger compounds can inhibit enzymes involved in inflammation, such as cyclooxygenase-2 (COX-2) and lipoxygenase. By blocking these enzymes, ginger reduces the production of inflammatory mediators like prostaglandins and leukotrienes. Ginger has been shown to decrease levels of pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-alpha) and interleukin-6 (IL-6). These cytokines play a key role in the inflammatory response and are often elevated in chronic inflammatory conditions. Z. officinale is effective in reducing inflammations related to the alimentary channel, such as colitis, by promoting the production of PI3K, Akt, NF-κB, and 6-shogaol, which protect against TNF-α-induced intestinal dysfunction in human intestinal cell models.[1] Gingerole in Z. officinale has anti-prostaglandin effects, beneficial for menstrual pain and dysmenorrhea. It inhibits leukotriene biosynthesis and suppresses 5-lipoxygenase synthesis. The rhizome hexane fraction extract supports allergic conditions management and prevention. Additionally, 6-shagol in Z. officinale is highly effective in treating gout, a joint rheumatic disease.[1]

Anti-cancer Effect

Z.officinale's bioactive molecules, including 6-gingerole, 6-shogaol, 6-paradol, and zerumbone, have anti-inflammatory and anti-tumorigenic properties, potentially preventing or controlling various cancers.[1] Ginger plant extract contains a new anticancer drug, β-elemene, which triggers apoptosis in non-small-cell lung cancer cells. It induces caspase-3, -7, and -9 activities, decreases Bcl-2 expression, and increases cytochrome c release. Ginger supplement also enhances enzyme activity of glutathione reductase, glutathione peroxidase, and glutathione-S-transferase, effectively suppressing colon carcinogenesis and effectively reducing colon cancer.[8] Gingerol, which found in ginger, inhibits pancreatic cell growth, prevents constipation-related cancer, and acts as an effective anti-tumor agent in leukemia cells.[5]

Antioxidant Activity

Ginger, containing zingerone, is effective in Parkinson's disease due to its ability to scavenge peroxide and hydroxyl ions, and has renoprotective effects in renal failures due to its anti-inflammatory properties and antioxidant properties. Ginger has renoprotective properties in renal failures due to its anti-inflammatory and antioxidant properties, which attenuate serum C-reactive protein levels and increase renal superoxide dismutase activity.[1] The antioxidant content and composition of plant extracts vary based on factors like extraction solvent, extraction temperature, duration, and storage conditions. Ginger extracts with ethanol, methanol, and acetone solvents showed higher activity.[7] Plants' antioxidant activity is crucial for two reasons. Firstly, it prevents or delays the oxidation of major biomolecules within cells by chelating metals or scavenging free radicals produced by metabolism. This prevents oxidative cell damage, which is linked to many diseases, and maintains cell components in a reduced state. Antioxidant constituents also protect the human body from free radicals and reactive oxygen species (ROS) effects.[10]

Anti-ulcer activity

Ginger and 6-gingerol inhibited experimental gastric ulcers in rats, while fresh ginger decocted in water improved symptoms in 10 peptic ulcer patients.[2] In vitro studies show that ginger's methanol extract, with a MIC of 25ug/mL, inhibits Helicobacter pylori, a bacterium responsible for peptic ulcers. Ginger Essential Oil significantly reduced gastric ulcers in rats, and significantly reduced oxidative stress produced by ethanol, as confirmed on stomach histopathology.[3]

Hypoglycemic Properties

Diabetes mellitus can be defined as a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both, leading to impaired function in carbohydrate, lipid, and protein metabolism, and is associated with significantly increased morbidity and mortality rates. (Zhang et al,2006).[5] Diabetes mellitus is a global epidemic, and traditional plant treatments offer potential natural products for treatment and management. Ginger, a traditional treatment, has hypoglycemic properties in vitro and in vivo. Oral administration of ginger extract to streptozotocin-induced diabetic rats showed a dose-dependent antihyperglycemic effect, reducing plasma glucose levels by 68% at a dose of 500 mg/kg body weight daily. Thus, ginger is a potential phytomedicine for diabetes treatment.[12]

CONCLUSION

Ayurveda recommends Zingiber officinale (ginger) for managing various disease conditions, despite modern perspectives on its antiviral, anti-inflammatory, anticancer, and antioxidant effects. Traditional Ayurvedic classics provide a strong literature base for administering ginger, but recent phytochemistry and ethnomedicinal studies have elaborated its uses in viral infections, carcinogenic

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conditions, and physiological needs.Comparing Ayurveda recommendations could be applied in modern disease prevention and health promotion scenarios.

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