

Review article

Zingiber officinale: A Simple Spice with Health Benefits & Some Modern Researches

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ABSTRACT

Zingiber officinale is a spice which is having a strong historical medicinal background and used by different systems of medicine for various ailments. It is also used to maintain the characteristic sharpness and tangy essence of food and beverages and used in carbonated drinks, as a conserve in sugar syrup. Ginger considered as an incredible drug for inflammation, gastrointestinal problems, pain and sexual problems since centuries. There are many studies carried out in recent years, which proves that the active constituents of ginger shows a variety of pharmacological effects like antiemetic, hepatoprotective, anti hyperlipidemic and antibacterial. The most momentous among all the nutraceutical aspects of ginger are its positive control on gastrointestinal tract including digestive stimulant action, anticancer effect and anti-inflammatory effect.

Keywords Ginger, Zingiber officinale, antiemetic, hepatoprotective

INTRODUCTION

Ginger is not a simple spice, it is a miraculous drug having a lot of medicinal benefits. It is cultivated broadly across the world without knowing its beneficial effects. It is a rhizomatous herb belonging to family Zingiberaceae. It is an aromatic herb which is branched and lumpy. It is used by different system of medicine for various ailments like, In Indian system of medicine it is used for dyspepsia, anorexia and pharyngitis, In Chinese system of medicine it is used for nausea, vomiting, cold, breathlessness, In Unani system of medicine it is used in indigestion, flatulence, loss of appetite, sexual problems and dementia. Different forms of ginger are used to treat a range of ailments like fresh, dried and powder form. There are two recognized forms of ginger, one is uncoated or scraped ginger and second one is coated or unscraped ginger, last one is official in British Pharmacopeia and Pharmacopeia of India. It is also produces in many other parts of the world, including Indonesia, Bangladesh, Mexico, Nigeria, Australia, Hawaii, Fiji, Nepal, Haiti, and Jamaica. India and China are the leading contributors of ginger in the world. In India, it is grown principally in the states of Karnataka, Kerala and northeast India. Calicut and Cochin varieties of India are popular all over the world. (Imtiyaz S et al., 2013; Tarannum A, 2015; Ashraf K et al., 2017; Anonymous, YNM; Bentley R, Trimen H, 1983)

Classification (Anonymous, 2017)

Kingdom: Plantae
Subkingdom: Tracheobionata
Division: Magnoliophyta

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Class: Liopsida
Sub Class: Zingiberidae
Order: Zingiberales
Family: Zingiberaceae
Genus: Zingiber
Species: Officinale
Botanical Name: Zingiber officinale Rosc.

Table 1. Vernacular names (Nadkarni KM, 2000; Dymock W et al., 2005)

Arabic	Zanjabeel
Persian	Shangwez
Greek	Hotiyoon
Sanskrit	Adrakam
Hindi	Adrak, Sonth
English	Ginger
Urdu	Zanjabeel
Bengali	Ada
Assamese	Ada
Gujrati	Sunth

BOTANICAL DESCRIPTION

It is a perennial aromatic herb. Rhizome is thick lobed, pale yellowish with narrow and linear-lanceolate, distichous, subsessile, dark green leaves with a slender tip. A yellow or white flower grows directly from the root and terminates in a long spike. It is creeping type thick rhizome, which extends underground. Its fruits are not observed. Ginger flowers and bruised stem have the characteristic aromatic fragrance. Short and fibrous fracture found. Taste and smell is pungent. Sterile nature of plant, having no seeds but the propagation takes place by rhizomes. Hot and humid conditions are favourable

for its cultivation. (Ashraf K et al., 2017; Anonymous, YNM; Tauheed A et al., 2017; Anonymous, 1976; Kirtikar KR, Basu BD, 1993)



Fig.1 Dried Rhizome



Fig. 2 Fresh Rhizome

Chemical composition

The standard constituents of ginger are volatile oil, starch and resin. Its odour is due to the presence of its volatile oil, gingerols of which the major pungent principle is [6]-gingerol (1-[40-hydroxy-30-methoxyphenyl]-5-hydroxy-3-decanone), an oily liquid, and the most abundant constituent among the gingerols, less pungent zingerone is also produced from gingerols during drying process and its pungent taste is due to the presence of resin and zingerone, shogaols, gingerols. Ginger also contains acrid resinous substances. The essential oil is pale yellow, laevogire and not acrid. The essential oil of ginger contains various terpenes and sesquiterpenes like zingiberene. The volatile oil contains zingiberene (35%), curcumene (18%) and farnesene (10%), with lesser amounts of bisabolene and b-sesquiphellandrene. (Singh MP, Panda H, 2005; Srinivasan K, 2017; Shamsi S, 2010)

Parts used

- ❖ Rhizomes. (Bentley R, Trimen H, 1983; Nadkarni, KM, 2000; Khan MA, YNM; Mohammad AH, YNM; Anonymous, 2004)

Temperament

- ❖ Hot2 and Dry2. (Nadkarni KM, 2000; Singh MP, Panda H., 2005)
- ❖ Hot3 and dry1. (Kabiruddin M, 2007)

Taste

- ❖ Bitter, sharp. (Kabiruddin M, 2007)

Colour

- ❖ Pale yellow. (Bentley R, Trimen H, 1983)

Odour

- ❖ Pungent. (Anonymous, YNM; Nadkarni KM, 2000)

Actions (Khan MA, YNM; Mohammad AH, YNM; Kabiruddin M, 2007; Ghani N 1921)

- Hazim (digestive)
- Mushtahi (appetizer)
- Muqawwie Meda (Stomachic)
- Mufatteh sudad jigar (Remove obstruction of Liver)
- Kasir riyah (carminative)
- Muqawwie meda (stomachic)
- Muqawwie jigar (liver tonic)
- Muhammir (Rubefacient)
- Mulaiyine shikam (laxative)
- Jali (detergent)
- Munaffise balgham (expectorant)
- Muhallile auram (anti-inflammatory)
- Muqawwiye bah (Aphrodisiac)
- Muhallile fuzlate balghami
- Mudirre baul (diuretic)
- Muqawwiye hafiza (cognitive enhancer)
- Tiryaaq (antidote)
- Habise ishal (Anti diarrheal)

Istematlat (Uses) (Khan MA, YNM; Mohammad AH, YNM; Kabiruddin M, 2007; Ghani N 1921)

- Zofe ishteha (Anorexia)
- Zofe Jigar (Liver debility)
- Nafakhe shikam (Flatulence)
- Amraze balghami (Phlegmatic disorders)
- Zofe bah (Sexual debility)
- Zeequnnafas (asthma)
- Nisyan (Dementia)
- Suzak (Gonorrhoea)
- Humma e muzmin (Chronic fevers)
- Matli (Nausea)
- Suaal (cough)
- Haiza (Cholera)
- Istisqa (ascites)
- Sue hazm (Indigestion)
- Sailanur rahem and dardi pusht (Leucorrhoea and backache)
- Suda (headache)
- Irequnnasa (sciatica)
- Wajaul mafasil (arthritis)
- Gathiya (rheumatism)
- Khuruje miqad (rectal prolapse)

Muzir (Adverse effect)

- ❖ Throat. (Khan MA, YNM; Mohammad AH, YNM; Kabiruddin M, 2007)

Musleh (Correctives)

- ❖ Rogan e badam (Almond oil), shahad (Honey). (Khan MA, YNM; Mohammad AH, YNM; Kabiruddin M, 2007)

Badal (Substitute)

- ❖ Darfilfil (Piper longum). (Khan MA, YNM; Mohammad AH, YNM; Kabiruddin M, 2007)

Miqdar-e-khurak (Dosage)

- ❖ 1 to 1.5 masha. (Kabiruddin M, 2007)
- ❖ Up to 7 masha. (Kabiruddin M, 2007)

THERAPEUTIC EFFECTS

Anti diabetic cardiomyopathic effect

Behrouz Ilkhanizadeh et al (2016) study indicated that ginger extract significantly reduces heart structural abnormalities in diabetic rats and that these effects might be associated with improvements in serum apo, leptin, cathepsin G, and Hcy levels and with the antioxidant properties of ginger extract. The results revealed concurrent significant increases in plasma C-reactive protein (CRP), homocysteine (Hcy), cathepsin G and apoB levels and decreases in apoA and leptin levels in the non-treated diabetic group compared to the control group. Moreover, heart structural changes, including fibrosis and heart muscle cell proliferation, were observed in non-treated diabetic rats compared to the control rats. Significant amelioration of changes in the heart structure together with restoration of the elevated levels of Hcy and CRP, leptin, cathepsin G, and apoA and B were found in the ginger extract-treated diabetic group compared to the non-treated diabetic group. (Ilkhanizadeh B et al., 2016)

Effect on heavy menstrual flow

Pizzorno and Murray, 2006 revealed that foods that create inflammatory responses within the body attribute to heavy menstrual bleeding. In return, herbs or chemical medications that inhibit prostaglandin synthesis and leukotriene formation may provide an anti-inflammatory effect and diminish the menstrual blood loss. Because of the insidious nature of heavy menstrual bleeding and its potentially serious consequences, it is imperative to utilize an effective anti-inflammatory treatment. Kashefi et al (2015) study exposed that ginger can significantly decrease the amount of heavy menstrual bleeding; though its true mechanism of action is still unknown. (Pizzorno J, Murray M, 2006; Kashefi F et al., 2015; Chen C X et al., 2016)

Hypoglycemic and lipid lowering effect

Sadegh Jafarnejad et al (2017) meta-analysis included 7 randomized controlled trials which involved a total of 609 adults with T2DM or hyperlipidemia. Results of study show that ginger supplementation led to significant reductions in plasma levels of TGs, TC, and FBG, but non-significant reduction in LDL-c levels, compared with placebo. Furthermore, intervention group showed significant increase in HDL-c levels. A considerable and significant heterogeneity for mean change of nearly all indicators. Subgroup analysis revealed that the effects of ginger might differ by factors such as clinical condition (hyperlipidemia and T2DM) and quality assessment. The analysis of RCTs by subgroup of clinical condition indicated that ginger consumption resulted in significant improvements in TGs, HDL-c, TC, FBG, but not LDL-c in hyperlipidemic patients. In T2DM patients, intervention group had significant improvements in TGs and FBG levels. Another analysis was conducted based on quality assessment; high quality studies showed results similar to those of overall analysis while in high quality studies a significant difference was found in the mean change of FBG levels but not other factors.

Jie Zhu et al (2018), systematic review and meta-analysis provide convincing evidence for the effects of ginger on glucose control, insulin sensitivity, and improvement of blood lipid profile. Based on the positive effects and negligible side effects, ginger may be a promising adjuvant therapy for T2DM and MetS. Further high-quality studies with larger sample sizes and longer duration of treatment are needed to examine these findings and evaluate the potential BMI lowering effect of ginger. (Jafarnejad S et al., 2017; Zhu J et al., 2018)

Anticancer effect

Wang et al. (2014) Studies suggest that ginger and its pungent bio-active components, which include gingerols and shogaols, can be used in the prevention and treatment of cancer. Prasad & Tyagi, (2015) experimental (in vitro/in vivo) and clinical trials revealed that Ginger extract and [6]-gingerol exhibit antiproliferative, antitumor, and anti-invasive effects via various mechanisms including NF- κ B, STAT3, Rb, MAPK, PI3K, Akt, ERK, cIAP1, cyclin A, cyclin-dependent kinase (Cdk), cathep-sin D, and caspase-3/7.

Kumara M et al. (2017) showed in its study that 6-gingerol is identified as a very good phytochemical compared to other ginger ligands like 8-gingerol, 10-gingerol and 6-shogaol and approved drugs like, DLsulfiram and Quercitrin, research thrust may be focused on drug development using 6-gingerol against cancer. (Wang B et al., 2014; Prasad S, Tyagi AK 2015; Kumara M, 2017)

Antifungal effect

Sheida Shabaniyan et al. (2017) examined the clinical effect of ginger cream along with clotrimazole compared to vaginal clotrimazole alone in the study. This double-blind clinical trial was conducted on 67 women admitted to the Gynecology Clinic of Hospital with vaginal candidiasis. The patients were divided randomly into two groups of 33 and 34 people. The diagnosis was made according to clinical symptoms, wet smear, and culture. Ginger-clotrimazole vaginal cream 1% and clotrimazole vaginal cream 1% were administered to groups 1 and 2, respectively, once a day for 7 days. Ginger and clotrimazole vaginal cream 1% is more effective than the clotrimazole vaginal cream 1% alone in the reduction of complaints and improvement of patients with vaginal candidiasis. This cream, as an herbal and natural medicine, may be a good alternative for people who cannot use azoles. (Shabaniyan S et al., 2017)

Neuroprotective and cognitive-enhancing effects

Chatchada Satalangka et al. (2017), the combined extract of *C. rotundus* and *Z. officinale*, is a potential supplement to improve neurodegeneration and memory impairment. The possible mechanism for its beneficial effects may be through improving oxidative stress status, which in turn would increase pERK1/2 in the hippocampus, leading to improvement in memory impairment. In addition, this extract can also suppress AChE activity in the hippocampus, giving rise to increased available ACh and increased function of ACh via the nicotinic receptor, resulting in enhanced memory performance. (Satalangka C, Wattanathorn J, 2017)

Hepatic and renal protective effect

Deepmala Joshi et al. (2017) suggested that *Zingiber officinale* Rosc. extract and its active compound 6-Gingerol, as a nontoxic, inexpensive dietary component, is a promising agent for ameliorating mercuric chloride toxicity through inhibition of oxidative stress and enhanced the antioxidant enzymes. Moreover, ZO extract and GG also have attenuated HgCl₂-induced tissue biochemical toxicity by modulating hepatorenal markers, dietary intake of *Zingiber officinale* Rosc. extract or 6-Gingerol may offer a novel and safe method to protect human health against inorganic mercury exposure. (Joshia D et al., 2017)

Protective effect in Rheumatoid Arthritis

Funk JL et al. (2016) studied that a greater joint protective effect of a crude ginger extract containing gingerols and GEO as compared to gingerols alone (when normalized to gingerol

content) suggested that the crude extract's GEO content could account for its enhanced anti-inflammatory effect in an experimental model of rheumatoid arthritis.

Zingiber officinale and Alpinia galanga tablets lower osteoarthritis tendency. The mechanism of action is believed to be due to the inhibition of prostaglandin and leukotriene synthesis. (Funk J L et al., 2016; Selga G, 2014)

Antiemetic effect

E. Soltani et al.(2018) showed that 500 mg oral ginger (based on the patient's weight) 1h before the operation may significantly reduce the incidence of 24-hour post operative nausea and vomiting in patients undergoing laparoscopic cholecystectomy. 100 patients with cholelithiasis who were candidate for laparoscopic cholecystectomy. Patients were divided into two groups: group A comprised 50 patients who received 500 mg oral ginger 1 h before surgery, and group B included 50 patients who received 4 mg intravenous ondansetron before completion of surgery. Multifactor analysis showed that nausea severity was significantly lower in the ginger group, the data indicated that except 16 h after operation, the differences between two groups in the frequency of vomiting was not significant. (Soltani E, 2018)

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CONFLICT OF INTEREST

No conflict of interest is involved in writing of this article

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