



Ginger

Zingiber officinale

Common names

Common ginger, African ginger, Jamaica ginger, zingiber, shokyo (Japanese)¹

Family

Zingiberaceae (Ginger)

Part used

Rhizome

Background and traditional uses

The ginger family, *Zingiberaceae*, is a monocotyledenous family in the order *Zingiberales*. This family is tropical in native distribution and is a particularly common Indomalayan flora, in the areas between India and New Guinea. Some species grow in more temperate climates. The genus name comes from the Greek '*Zingiberi*', which in turn is derived from a Sanskrit word meaning 'root'. *Zingiberaceae* species typically have thick, fleshy rhizomes with secretory cells that produce pungent essential oils. Plants in the *Zingiberaceae* include common ginger, turmeric, galangal and cardamom.

Common ginger has been revered as both a spice and medicinal plant since ancient times, and is written of extensively in Vedic, Buddhist, Arabic, Greek and Roman texts. It is a reed-like plant with a large rhizome that is valued for its combination of pungent and aromatic qualities that arise from its content of phenolic compounds and essential oils.²

Actions

Primary:

- Antiemetic
- Anti-inflammatory
- Aromatic digestive
- Antiplatelet
- Carminative¹

Secondary:

- Analgesic
- Antifungal
- Antimicrobial
- Antioxidant
- Antiparasitic
- Antiulcer
- Antiviral
- Chemoprotective¹
- Circulatory stimulant³
- Cognitive enhancer^{4,5}
- Diaphoretic³
- Hypoglycaemic
- Hypolipidaemic
- Immunomodulator¹

Applications and indications

Ginger has been used in traditional medicines the world over since antiquity. It has a wide reputation as a digestive medicine applied to:

- nausea and vomiting related to pregnancy, chemotherapy and other emesis-inducing medications, motion sickness and gastrointestinal disturbance
- dyspepsia
- flatulence
- colic
- vomiting
- digestive spasm
- indigestion.⁶⁻⁸

It has also been recommended in the treatment of:

- heavy menstrual bleeding
- dysmenorrhoea
- headaches
- migraines
- rheumatic and muscular disorders.⁶⁻⁸

Active constituents and pharmacodynamics

Ginger root is rich in an oleoresin that is responsible for its distinctive fragrance and appears to contain its chief active constituents, sesquiterpene hydrocarbons and phenolic compounds.

Of the sesquiterpenes in ginger, beta-sesquiphellandrene, zigerene, alpha-curcumene, and beta-bisabolene are the most common. Of the phenolic compounds, gingerols, shogaols, zingerone and paradol have been the most heavily researched. Interestingly, while zingerone and the shogaols are only found in small amounts in fresh ginger, they are far more concentrated in dried ginger products and extracts, perhaps explaining why fresh and dried ginger are effectively used as two different medicines in traditional Chinese medicine (TCM).¹

The gingerols and shogaols in ginger appear to be primarily responsible for the herb's antiemetic effects by either binding to muscarinic receptors/modulatory binding sites and thus having an effect on the 5-HT(3) receptor ion-channel complex.¹ Constituents of the volatile oils in ginger have also been found to interact with the same complex, exerting an antispasmodic effect in rat models.¹

Summary of clinical evidence

Menstrual disorders

In a double blind, randomised, placebo-controlled trial, the blood loss of 92 young women aged 15-18 years old was evaluated over six consecutive menstrual periods with heavy menstrual bleeding being confirmed by the Pictorial Blood Assessment Chart in the final three cycles. The subjects were then split into two groups and administered either 250mg dried ginger powder three times daily or placebo over three intervention cycles. The levels of menstrual blood loss in the study group dramatically declined during the three-month trial, particularly when compared to the placebo group ($p < 0.001$).⁹

In a double-blind, comparative trial on 150 women with primary dysmenorrhoea, 250mg doses of dried ginger rhizome powder administered four times daily for three days from the first day of the menstrual cycle proved to be as statically effective as 250mg mefenamic acid or 400mg ibuprofen in relieving pain.¹⁰

Cognitive enhancement

In a double-blind, randomised, placebo-controlled trial, 60 healthy, middle-aged women were split into three groups to receive either placebo or 400mg or 800mg ginger daily over a two-month period. Their working memory and cognitive functions were evaluated before the trial commenced, at one month and at the conclusion of the trial, using computerised battery tests, word and picture presentation tests, simple reaction time tests and the auditory oddball paradigm of event potentials. Both attention and cognitive processing abilities were significantly enhanced in both study groups compared to placebo at the conclusion of the trial, with the 800mg dose showing additional benefits for delayed word recognition, digit vigilance, choice reaction, numeric working memory and spatial working memory as well as reaction time. The researchers were unable to determine the mechanism of action in this instance.⁴

A later *in vivo* study confirmed that dried ginger extracts significantly improved the ability of mice to recognise novel objects, indicating improvements in learning and memory. The researchers determined that ginger had a synaptogenic effect via the nerve growth factor (NGF)-induced extracellular-signal-regulated kinase (ERK)/cyclic AMP response element-binding protein (CREB) activation that resulted in memory enhancement.⁵

Another *in vivo* study showed that ginger extracts improved cognitive function and neuron density in the brains of rats who had been submitted to a permanent occlusion of right middle cerebral artery. The researchers concluded that this was at least partly due to the antioxidant actions of ginger.¹¹

Antiemetic

In double-blind, placebo-controlled, randomised trial, 102 HIV positive patients undertaking antiretroviral therapy (ART) were split into two groups. Participants were administered either 500mg ginger or placebo twice daily, 30 minutes before therapy over a period of 14 days. At the conclusion of the trial, nausea frequency and severity in the study group was significantly lower than the placebo group and vomiting episodes were significantly fewer.¹²

In a double-blind, placebo-controlled, randomised trial, 60 cycles of chemotherapy with high emetogenic potential were randomised to have the subject receive either placebo or dried ginger root capsules prescribed according to the patient's weight. The participants were young people between the ages of eight and 21 who were receiving chemotherapy for bone sarcoma, in addition to the standard antiemetics, Ondansetron and Dexamethasone. The subjects were administered either ginger or placebo from days one to three of the chemotherapy cycle. In the control cycles, mild to moderate nausea was recorded in 93.3% of subjects, while the study cycles recorded only a 55.6% incidence. The researchers concluded that ginger had a statistically significant antiemetic benefit for young patients receiving chemotherapy.¹³

In a double-blind, multicenter trial, 576 cancer patients undergoing chemotherapy were randomised into four groups and administered either placebo, 500mg, 1g or 1.5g of a purified liquid extract of ginger root with concentrated 8.5mg of combined gingerols, zingerone and shogaol content. The ginger preparation was taken for three days leading up to chemotherapy and for the three days of the cycle. Patients rated their nausea on a seven-point scale at baseline, day one of chemotherapy and the conclusion of the study. The final analysis showed that the study groups experienced significantly reduced nausea compared to placebo on day one of chemotherapy. The largest reductions in nausea occurred in the 500mg and 1g groups, which was statistically significant.¹⁴

A recent systematic literature review identified seven randomised and/or crossover trials of ginger versus placebo or current antiemetic therapies in patients undergoing chemotherapy. These studies collectively favoured ginger over placebo.¹⁵ Another systematic review of the evidence from randomised controlled trials for or against the efficacy of ginger for nausea and vomiting found that they collectively favoured ginger over placebo.¹⁶ Furthermore, a meta-analysis of six studies regarding the efficacy of the use of ginger in nausea and vomiting in early pregnancy (NVEP) suggested that it is a very effective treatment for women experiencing morning sickness.¹⁷

Gastric emptying

In a small study on 24 subjects who had been diagnosed with functional dyspepsia, 1.2g dried ginger root taken one hour before a meal of soup was shown to acutely increase the intensity and frequency of antral contractions.¹⁸

Weight loss/thermic

A small study on 10 overweight but otherwise healthy men showed that 2g of ginger powder dissolved in warm water alongside a breakfast muffin resulted in a higher thermic effect of the food independent of increases in metabolic rate. The dose also resulted in a greater feeling of satiety in the subjects without influencing systemic hormones. The results suggested a potential role for ginger in weight management.¹⁹

Hypoglycaemic/hypolipidaemic

A meta-analysis of nine randomised, placebo-controlled, clinical trials measuring the effects of ginger on blood glucose and lipid concentrations in patients with diabetes or hyperlipidaemia showed that ginger intake significantly reduced fasting blood glucose and triglycerides and significantly increased high density lipoprotein (HDL) cholesterol in ratio to low density lipoprotein (LDL). This was at a mean dose of three grams daily for type 2 diabetes and hyperlipidaemia.²⁰ Another meta-analysis determined that ginger supplementation significantly reduces serum C-reactive protein and improves glycaemic indexes and lipid profiles. A range of doses from one to three grams per day was administered in these trials.²¹

An *in vivo* study concluded that via its actions as a serotonin receptor antagonist, ginger can increase insulin release from INS-1 cells. Serotonin normally suppresses insulin release in these cells, and antagonising the 5-HT(3) receptor can alleviate this suppression and lead to a reduction in blood glucose of up to 35% in a rat model.²²

Digestive anti-inflammatory

In a double-blind, randomised, placebo-controlled trial, 30 healthy subjects were given either 2gm dried ginger or placebo once daily for 28 days. The subjects underwent a flexible sigmoidoscopy at baseline and on the final day of the trial. Biopsies showed a significant reduction in eicosanoid levels in the study group when compared to placebo. The researchers concluded that ginger may hold benefit for those at risk of developing colorectal cancer and other inflammatory bowel diseases.²³



Digestive antimicrobial

An *in vitro* study showed that an extract of dried, powdered ginger, containing isolated constituents, 6-, 8-, 10-gingerol and 6-shogaol, significantly inhibited the growth of 19 strains of *Helicobacter pylori*, the micro-organism associated with peptic ulcer disease and gastric and colon cancers.²⁴ Both ginger extracts and several ginger compounds (including 6-gingerol) have demonstrated gastroprotective activity in rats, likely due to their antimicrobial actions.²

Dosage summary

Liquid extract (1:2): 5–15mL weekly²⁵

Dried herb equivalent: 1–3g dried root daily²⁵

Safety information

- One clinical trial on post-operative patients reported gastric irritation, heartburn and bloating in some subjects.²⁶
- Due to ginger's antiplatelet activity, theoretically it may interact with warfarin and antiplatelet drugs, although this is not evident clinically.¹
- Ginger is not recommended for children under the age of six years due to its pungent nature.¹
- Despite popular use in the treatment of morning sickness, the Commission E suggests that ginger is contraindicated in pregnancy.²⁷ More recent research suggests that ginger is well tolerated by pregnant women in doses up to 2g dried ginger daily, or equivalent.¹
- The Commission E also suggests that ginger be used with caution in patients with gallstones, gastric ulcers and reflux and supplementation should be ceased at least one week before any major surgeries.²⁷
- There is a possible increase in bioavailability for medication co-administered with ginger due to ginger's stimulatory effects.²⁸

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