



ISSN (E): 2320-3862
ISSN (P): 2394-0530
www.plantsjournal.com
JMPS 2021; 9(3): 101-104
© 2021 JMPS
Received: 02-01-2021
Accepted: 05-03-2021

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A review on ginger (*Zingiber officinale* Rosc) with unani perspective and modern pharmacology

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Abstract

Ginger is an incredible perennial herb belonging to the family Zingiberaceae, comprises rhizome of the *Zingiber officinale* Rosc. It has been widely used all over the world since antiquity, for a wide array of unrelated ailments that include arthritis, rheumatism, sprains, muscular aches, pains, sore throats, cramps, constipation, indigestion, vomiting, hypertension, dementia, fever, infectious diseases and helminthiasis. It is commonly known as Saunth, and Zanjabeel. Ginger is a strong anti-oxidant substance and may either mitigate or prevent generation of free radicals. These actions may be attributed due to the chemical compounds have been isolated from the plant, mainly coumarins, flavonoids, terpenoids, volatile oils and amino acids etc. Numerous experimental and clinical trials have proven ginger for its range of therapeutic activities such as antibacterial, antidiabetic, antiemetic, hypolipidaemic, hepatoprotective etc properties. The present article aims to explore traditional Unani and pharmacological activities of this herb reported till date.

Keywords: Ginger, *Zingiber officinale*, modern pharmacology

Introduction

Ginger (*Zingiber officinale* Roscoe) is one of the most widely-used spices and it is a common additive in a large number of compounded foods and beverages due to its flavour and pungency [1]. It is reputed to have medicinal properties against digestive disorders, rheumatism, dropsy, neuralgia and diabetes. Ginger is a member of the family of plants that includes cardamom and turmeric. The strong aroma of ginger is the result of pungent ketones including gingerol, the extract that primarily has been used in research studies [2]. The consumed portion of the ginger plant is the rhizome, often called “ginger root,” although it is not actually a root. The rhizome is the horizontal stem of the plant that sends out the roots. Its fresh rhizome is known as Adrak in Urdu, Zanjabeel Ratab in Arabic, Zanjabeel Taza in Persian, Ginger in English and Adaraka in Hindi [3-5].

History of Ginger

Ginger's current name comes from the Middle English *gingivere*, but this spice dates back over 3000 years to the Sanskrit word *srngaveram*, meaning “horn root,” based on its appearance. In Greek, it was called *ziggiberis*, and in Latin, *zinziberi*. Interestingly, ginger does not grow in the wild and its actual origins are uncertain.

Indians and Chinese are believed to have produced ginger as a tonic root for over 5000 years to treat many ailments, and this plant is now cultivated throughout the humid tropics, with India being the largest producer. Ginger was used as a flavoring agent long before history was formally recorded. It was an exceedingly important article of trade and was exported from India to the Roman Empire over 2000 years ago, where it was especially valued for its medicinal properties. Ginger continued to be a highly sought-after commodity in Europe even after the fall of the Roman Empire, with Arab merchants controlling the trade in ginger and other spices for centuries. In the thirteenth and fourteenth centuries, the value of a pound of ginger was equivalent to the cost of a sheep. By medieval times, it was being imported in preserved form to be used in sweets. Queen Elizabeth I of England is credited with the invention of the gingerbread man, which became a popular Christmas treat [6-8].

Distribution

Ginger originated in the IndoMalayan region, is now widely distributed across many countries as a spice and medicinal plant. India is the world's largest producer of ginger at present.

Traders took ginger from India to Mediterranean region during the 1st century. The Arabs introduced ginger to East Africa in the 13th century and the Portugese spread it to West Africa and the Pacific islands for commercial cultivation. The major ginger growing countries include Australia, Brazil, Bangladesh, Cameroon, China, Costa Rica, Fiji, Ghana, Guatemala, Hawaii, India, Indonesia, Jamaica, Mauritius, Malaysia, Nepal, New Zealand, Nigeria, Philippines, Sierra Leone, Sri Lanka, Taiwan, Thailand, Trinidad and Uganda covering a total area of 387,300 ha with a production of 1,476,900 MT. In India, it is cultivated mainly in Kerala, Andhra Pradesh, Uttar Pradesh, West Bengal and Maharashtra [3, 4, 9].

Scientific Classification [3-5, 9-11]

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Division	:	Magnoliophyta
Class	:	Liliopsida
Subclass	:	Zingiberidae
Order	:	Zingiberales
Family	:	Zingiberaceae
Genus	:	Zingiber
Species	:	officinale

Morphological Characters of Ginger Plant [3-5, 12]



Rootstock: Horizontal, tuberous.

Leafy stem: Elongated leaves; oblong-lanceolate, clasping the stem by their sheaths.

Spikes: Usually radical, rarely lateral or terminal on the Leafy stem peduncle short or long; bracts persistent, usually single.

Calyx: Cylindric, shortly three-lobed.

Corolla tube: Cylindric; segments lanceolate, upper concave

Lateral staminodes: Zero or adnate to obovate-cuneate lip; filament short; anther cell contiguous, crest narrow, as long as the cells.

Ovary: Three celled; ovules many, superposed; style filiform; stigma small, subglobose.

Capsule: Oblong, finally dehiscent. Seed: Large, globose, arillate.

Rhizome: Stout tuberous with erect leafy stems 0.6 to 1.2 m high. Size: Length 5 to 15 cm, width 3 to 6 cm; thickness 0.5 to 1.5 cm. Shape: Laterally flattened on the upper side with short flattened oblique, obovate branches or fingers. Each branch is 1 to 3 cm long and at its apex shows a depressed

scar of the stem

Leaves: Narrow, distichous, subsessile on the sheaths, linear lanceolate 1 to 2 cm wide, glabrous.

lowers: Greenish with a small dark purple or purplish black lip, in radical spikes 3.8 to 7.5 cm long and 2.5 cm diameter on peduncles 15-30 cm long.

Stamens: Dark purple, as long as the lip, rather shorter than the corolla.

Cultivation [13-16]

It is done in the month of December or January when the plants wither after flowering period. Rhizomes are dug out and after that aerial stems, fibrous roots and buds are removed. They are washed to remove clay attached to them. Rhizome is peeled on flat surface as well as between the fingers and thoroughly washed in running water. It is then dried completely by keeping in the sun on mats. If moisture is present, it may become mouldy and after drying it loses about 70% of its weight.

Cochin Ginger: In South India, it is only partially peeled and bleached by dipping in to the milk of lime. It is thus coated and bleached.

Jamaica Ginger: It is deprived of its cork and outer cortex that is coat and so it is called uncoated ginger. It is not bleached with calcium salts and so it is called unbleached ginger.

African Ginger: It is darker and smaller than Cochin ginger. It is more pungent but lacks the aroma of Jamaica ginger.

Vernacular Names [3-5, 13-16]

Hindi	:	Sonth, Ada, Adrak
English	:	Ginger Root, Ginger
Arabic	:	Zanjabeel, Qafeer
Persian	:	Sahangrez, Shangoweez Zanjabil
Urdu	:	Sonth, Zanjabeel, Adrak
Unani	:	Hutiyoan
Sanskrit	:	Ardrakam
Telugu	:	Dried rhizome- Sonti, Fresh rhizome- Allam
Marathi	:	Ardrak, Ale
Gujarati	:	Adu

Temperament [16-20]: Hot 3° Dry 2°; Hot 30 and Moist 10; Hot 20 and Dry 20

Phytochemical Constituents [21-26, 27-31]

- **Volatile Oils:** Volatile oils, also known as ginger essential oils, are generally composed of terpenoids. Ginger essential oils give a unique aromatic smell. Volatile oil composition varies based on where it is harvested.
- **Gingerol:** Gingerol is the spicy component. It is a mixture of various substances, all of which contain the 3-methoxy-4-hydroxyphenyl functional group. Gingerols can be divided into gingerols, shogaols, paradols, zingerones, gingerdiones, and gingerdiols, according to the different fatty chains connected by this functional group.
- **Diarylheptanoids:** Diarylheptanoid is a group of compounds with 1,7-disubstituted phenyl groups and

heptane skeletons in its parent structure. Currently, it can be divided into linear diphenyl heptane and cyclic diphenyl heptane compounds with antioxidant activity.

- **Proteins and Amino Acids:** Ginger contains a variety of amino acids, including glutamate, aspartic acid, serine, glycine, threonine, alanine, cystine, valine, methionine, isoleucine, leucine, tyrosine, phenylalanine, lysine, histidine, arginine, proline, and tryptophan. It also contains polysaccharides, cellulose, and soluble sugar.
- **Organic Acids:** Ginger also contains oxalic acid, tartaric acid, lactic acid, acetic acid, citric acid, succinic acid, formic acid, and malonic acid.
- **Inorganic Elements:** Ginger has been shown to contain more than 20 inorganic elements such as K, Mg, Ga, Mn, P, Al, Zn, Fe, and Ba.

Therapeutic Actions and Uses In Unani Literatures ^[14-25]

- Zukam (Coryza), Sua'al (Cough), Suda (Headache) And Zeequnafas (Asthma)- Decoction and Juice (Juice of fresh ginger is mixed with honey).
- Niqras (Gout), Irq-Un Nisa (Sciatica), Wajaul Mafasil (Rheumatoid Arthritis) And Auram (Inflammations)- Paste (The paste of fresh ginger rhizome).
- Suda (headache), Wajaul mafasil (Arthritis) and Tahajjure mafasil (Ankylosing Spondylitis)- Oil for external application (mixed with Roghane Kunjad i.e., Sesame oil)
- Bahtus saut (Hoarseness of voice) - Use of dried rhizome (10 g) mixed with jiggery (17 g) before breakfast.
- Zoafe ishteha (Lack of appetite) and Nafakhe shikam (Flatulence)- Ginger along with salt is advised just before the meals
- Others- Bawaseer (Haemorrhoids), Istisqua (Ascites), Khuraje Miq'ad (Rectal Prolapse), Sue Hazm (Dyspepsia), Suqoote Ishteha (Anorexia), Daus Salab (Alopecia Areata), Faliq (Hemiplegia), Laqwa (Facial Palsy) And ENT Disorders.

Caution ^[3-5, 16, 17]

Toxic to the people of Hot temperament.

Drug Interaction ^[28, 29]

Few ginger–drug interactions have been reported in the literature. The synergistic effect of ginger and nifedipine on antiplatelet aggregation in normal human volunteers and hypertensive patients has been studied in Taiwan. It has been found that the percentage of platelet aggregation induced by collagen, adenosine diphosphate (ADP) and epinephrine in hypertensive patients was larger than that in normal volunteers. Either aspirin or ginger could potentiate the anti-platelet aggregation effect of nifedipine in normal volunteer and hypertensive patients. These results suggested that ginger and nifedipine have a synergistic effect on anti-platelet aggregation. It has been recommended that combination of 1 g ginger with 10 mg nifedipine per day could be valuable to combat cardiovascular and cerebrovascular complication due to platelet aggregation.

Corrective ^[17-18]

Roghane Badam (*Prunus amgdalus* Batsch)

Alternative Or Substitute (Badal) ^[4, 18, 19]

Filfil Daraz (*Piper lomgum* L)

Dosage: ^[4, 5] 1-2 gm

Compound Unani Formulations ^[17-20]

Habb-e-Hilteet, Habb-e-Hindi Mohallil, Habb-e-Hindi Zeeqi, Habb-e-Kabid Naushadri, Habb-e-Shifa, Jawarish-e-Bisbasa, Jawarish-e-Fanjnosh, Jawarish-e-Jalinoos, Jawarish-e-Kamooni, Jawarish-e-Safarjali, Jawarish-e-Shahreyaran, Jawarish-e-Zanjabeel, Luboobe-Kabir, Luboobe-Saghir, Majoon-e-Flasifa, Majoon-e-Fanjnosh, Majoon-e-Jograj Gugal, , Majoon-e-Seer Alvi Khan, Majoon-eSuparipak, Majoon-e-Suranjan, Murabba-e-Zanjabeel, Raughan-e-Ispand, Raughan-eJauzmasil, Iyarij-e-Loghazia, Sufoof-e-Hazim Kalan.

Pharmacological Studies ^[1, 2, 10-12, 26-31]

- **Effect on lipid and glucose concentrations in blood:** It has been reported that treatment with a methanolic extract of dried rhizomes of ginger produced a significant reduction in fructose-induced elevation of lipid levels, bodyweight, hyperglycaemia and hyperinsulinemia.
- **Effect on blood clotting:** Due to the potential effects of ginger on platelet aggregation, ginger is a commonly-cited example of an herbal supplement that should be avoided in patients with thrombocytopenia, platelet function defects or coagulopathy, such as populations using ginger for its antiemetic effect in cancer chemotherapy.
- **Effect on blood pressure:** Several pieces of evidence, mainly from rat studies, have suggested that ginger exerts many direct and indirect effects on blood pressure and heart rate.
- **Anti-inflammatory and analgesic activities of ginger:** The anti-inflammatory properties of ginger have been known for centuries. In the early 1980s, it was reported for the first time that ginger has anti-inflammatory actions, as evidenced by its inhibitory effects on prostaglandins synthesis. Subsequently, it has been demonstrated that ginger contains constituents like gingerdiones and shogaols that have pharmacological properties mimicking dual-acting non-steroidal anti-inflammatory drugs (NSAIDs) in intact human leukocytes *In vitro*. It is established that neither ginger nor its constituents produce the gastrointestinal adverse effects that are usually produced by the conventional NSAIDs as a result of prostaglandin inhibition. In fact, ginger has been shown to protect against ulceration.
- **Effect of ginger on gastrointestinal tract (GIT):** The powdered rhizome of ginger has long been used in traditional medicine for alleviating the symptoms of GIT illnesses. An acetone extract of ginger and its constituents have been shown to enhance the gastric emptying of charcoal meal in mice. The effectiveness of ginger in emesis due to hyperemesis gravidarum, motion sickness and cancer chemotherapy has also been reported. Ginger has been recorded as being useful in preventing post-operative nausea and vomiting in humans, without a significant effect on gastric emptying.
- **Tissue and radio-protective effects of ginger:** Several extracts and fractions of ginger have been shown to protect against chemically-induced tissue damage. For example, It has been shown that pre-treatment of rats with an ethanol extract of the rhizome of *Z. officinale* and oil extracted from the plant were effective in ameliorating carbon tetrachloride and acetaminophen (paracetamol)-induced acute hepatotoxicity.
- **Anti-oxidant actions of ginger:** Several authors have shown that ginger is endowed with strong *In vitro* and *in*

vivo anti-oxidant properties. The antioxidant action of ginger has been proposed as one of the major possible mechanisms for the protective actions of the plant against toxicity and lethality of radiation and a number of toxic agents such as carbon tetrachloride and cisplatin, and as an anti-ulcer drug.

- **Anti-microbial actions of ginger:** Ginger extract (10 mg/kg) intraperitoneally had a dose dependent anti-microbial activity against *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Escherichia coli* and *Candida albicans*.

Adulterants, Substitutes, Allied Drugs, Varieties, Related Species ^[10-12]

Exhausted ginger, Capsicum or seeds *Aframomum melequeta* to increase pungency of exhausted ginger(adulterants); *Zingiber zerumbet* Rosc. ex. Sm., *Zingiber mioga* Rosc., *Zingiber casummar* Roxb. (related species/ substitutes).

Conclusion

Ginger contains diverse bioactive compounds, such as gingerols, shogaols, and paradols, and possesses multiple bioactivities, such as antioxidant, anti-inflammatory, and antimicrobial properties. In the future, more bioactive compounds in ginger could be isolated and their biological activities and related mechanisms of action should be further investigated. Ginger has been studied extensively in animal and *In vitro* models, leading to speculation for its use as an antioxidant, antimicrobial, antifungal, antineoplastic, and antihypertensive agent. However, none of these potential uses have been studied in humans. Notably, well-designed clinical trials on ginger and its various bioactive compounds will be needed to prove its efficacy against these diseases in human beings.

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