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ZINGIBER OFFICINALE (GINGER): A REVIEW BASED UPON ITS AYURVEDIC AND MODERN THERAPEUTIC PROPERTIES

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ABSTRACT

Ginger is utilized globally as a spice and herbal drug. Ginger, a plant of Zingiberaceae family, is a culinary flavor that has been utilized as a significant plant with therapeutic, and healthy benefits in traditional frameworks of medication like Chinese Medicine System, Ayurveda, Siddhia, Yunani, Folk arrangement of medication for a long time. Many phytochemical constituents are present in ginger. It exhibits some extraordinary medical advantages too. Ginger and its overall phytochemicals, for example, Fe, Mg, Ca, flavonoids, phenolic mixes (gingerdiol, gingerol, gingerdione and shogaols), sesquiterpenes and paradols have been utilized as herbal medication to treat different ailments like torment, cold indications and it has been appeared to have anti-inflammatory, anti-cancer, anti-pyretic, anti-microbial, anti-oxidant and anti- diabetic. It has been generally utilized for joint pain, cramps, sore throats, stiffness, muscle pain, torments, vomiting, obstruction, heartburn, hypertension, fever and irresistible sicknesses.

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INTRODUCTION

Herbs and spices play an important role in our everyday life. Medicinal herbs are considered as the principal line of treatment around the world, with over 80% of the population taking them for major and minor sicknesses (1). The therapeutic properties of these herbs have been known to humankind since ancient times. Plants have been utilized widely in all the traditional systems of medications, for example, Ayurveda, Siddha and Unani. The drugs obtained from these plants safe and cause no harm to the living systems (2). Ginger (*Zingiber officinale Roscoe*), a spice has been utilized through ages in practically all systems of medications against numerous diseases. The restorative piece of spice is dried roots as shown in figure 1 (3). Its spicy fragrance is because of the presence of ketones, particularly the gingerols, which comes out to be the essential phytochemical constituent of ginger (4). Ginger is known as Sunthi in Ayurveda and depiction of the plant shows up in the old content like Charaka, Sushruta, Vagbhatta and Chakra-dutta (5). It is broadly utilized around the planet in food sources as a flavor.

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For quite a long time, it has hold a significant place in Chinese, Ayurvedic and Tibb-Unani prescriptions for the treatment of catarrh, ailment, apprehensive infections, gum disease, toothache, asthma, stroke, blockage and diabetes (6,7,8). Ginger is utilized basically as a cure for stomach related disorders including dyspepsia, colic, aversion, gag, gastritis, and loose bowels (9,10). Some phenolic substances present in ginger have solid anti- inflammatory and anti-agitative properties and apply significant anti-cancerous properties and against mutagenic exercise (11,12,13). Moreover, 200 phytochemicals are distinguished from ginger, and its bioactive constituents consist of lubricious oils, anthocyanins, tannins, and sharp phenolic extracts known as gingerols, shogaols, and sesquiterpenes (14). *Zingiber officinale* is associated with properties like analgesic, anti-oxidant anti-diabetic, anti-microbial, hepatoprotective, immunomodulatory, nephroprotective, neuroprotective and larvicidal (15,16). Vernacular names taxonomy of *Zingiber officinale* are given in Table 1 and 2.

Morphology of *Zingiber officinale Rose* (Ginger): *Zingiber officinale Rose.* (Ginger) is a perennial plant which crawls perpetually on a thick tuberous rhizome, which spreads underground.

Figure 1. ***Zingiber officinale***

Table 1. Vernacular names of *Zingiber officinale* (Ginger) (18,19)

English	Ginger
Sanskrit	Adraka(Fresh), Shunthi(Dried), Shringaveran, Sringaaran
Hindi	Adrak(Fresh), Sonth (Dried)
Punjabi	Ada, Adrak
Assami	Ada
Bengali	Ada
Oriya	Ada, Adraka
Tamil	Ingee
Gujrati	Adhu (Fresh), Sunth, Shuntya(Dried)
Malayalam	Inchi
Marathi	Sunth, Shuntya(dried), Alha (Fresh)
Urdu	Adraka
Telugu	Allam
Kannada	Sunthi
Burmese	Khyenseing
Japanese	Shoga, Myoga
Singapore	Ingru
Spanish	Jengibre
Russian	Imbir
German	Ingwer

Table 2. Taxonomy of *Zingiber officinale Rose* (Ginger) (17)

Taxonomic Rank	Taxon
Kingdom	Plantae
Phyllum	Spermatophyta
Subphyllum	Angiospermae
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	*Zingiber*
Species	*officinale*
Common name	Ginger

The stem of ginger is 30-100cm tall. The bright greenish lance shaped leaves are 15-20cm long which have a very prominent longitudinal rib. Clusters of small yellowish-green flowers having purple speckles are enclosed in the leaves. The roots of ginger are classified into two types i.e. threadlike or woody and pulpy. In the primary year, a green, erect reed like stem about 60cm high develops from rhizome. The smell and taste are fragrant sharp and unique (20,21).

Geographical Distribution of *Zingiber officinale Rose* (Ginger): The main producers of ginger are 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 complete territory of 387,300 ha with a creation of 1,476,900 MT. India is the world's biggest ginger growing country among all(20). Ginger *(Zingiber officinale Rosc.)* is developed by limited and negligible peasants in the estate of Assam, Himachal Pradesh, Karnataka, Kerala, Meghalaya, Orissa, Sikkim and north eastern area of India just as other south east Asian nations, Africa and Hawaii (USA)(22,23).

Phytochemical Constituents of *Zingiber officinale* (Ginger): The rich photochemistry of *Zingiber officinale* makes this medicinal herb a significant health promoter (24). Fresh and dry both the forms of rhizome have diverse phytochemical constituents. Components like carbohydrates, minerals, moisture, proteins, fats, fiber, ash, vitamins, minerals, enzymes are present in the ginger rhizome. The main phytochemical constituents of ginger are categorized into Volatile and Non-volatile phytochemical constituents. Ginger obtains its specific odor from its volatile oils. While the pungency of ginger is due to the presence of non-volatile oils. The volatile oils of ginger are sesquiterpene and monoterpenoid hydrocarbons. Geraniol, curcumene b-phellandrene, (+)-camphene, 1,8-cineole, citral, terpineol, borneol, linalool, neral are some monoterpenoid hydrocarbons. Sesquiterpene hydrocarbons are Zerumbone, a-zingiberene, b-sesquiphellandrene, b-bisabolene, (E-E)-a-farnesene, arcurcumene, zingiberol. Non-volatile constituents are gingerols, shogaols, paradols, zingerone. Gingerols are primary non-volatile constituents which give a specific pungency to the fresh ginger. They are a homologous series of phenols. While the pungency of dry ginger is due to shogaols (dehydrated gingerols) {for example, (6)-shogaol (2)}. Paradol and allied derivatives are formed by the hydrogenation of shogaols which are known for various pharmacological properties. Diarylheptanoids are known to be present in both the forms of ginger i.e. fresh and dry ginger (25-31). Zingibain is a miscellaneous phytochemical constituent of ginger. Fig. 2 showing chemical structures of some of its phytochemicals.

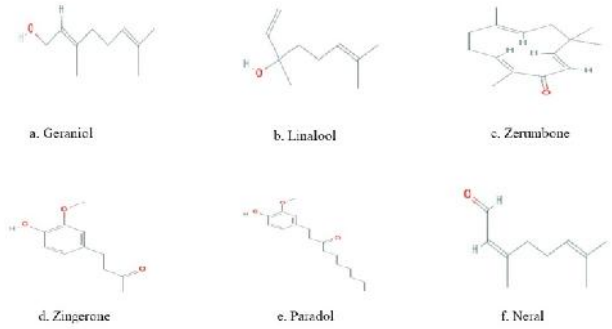

Figure 2.Chemical structures of phytochemical constituents of *Zingiber officinale*

Folk view on *Zingiber officinale* (Ginger): Ginger is utilized worldwide as a cooking flavor, topping, and herbal cure. The Chinese have utilized ginger for 2500 years as a stomach related problems and as an anti-nausea, and to treat draining issues and stiffness; it was likewise used to treat hairlessness, toothache, snakebite, and respiratory problems (32,33). Ginger is a vital medicine in the folk system of medicine. Fresh ginger juice is used by pregnant women at the time of childbirth as it helps in easy childbirth (34). Ginger is an ethnic solution for various ailments like torment, stiffness, distraught seizure, breakdown, scabies, blockage, heartburn, prolepsis, fistula, cholera, throat torment, tuberculosis, cold, fever and hack (35). Ginger alongside *P. longum* is utilized as an abortifacient in certain clans (36).

Ayurvedic View on *Zingiber officinale* (Ginger): The fundamental purpose of Ayurvedic treatment is to balance the three components of the body i.e. vatta (Space and Air), pitta (Fire and Water) and kapha (Earth and Water) (37,38,39,40). Ginger assumes a significant role in the antiquated customs of

Ayurveda. As indicated by Ayurveda particularly, the numerous utilizations of ginger, makes the tuber one of the main herbs in the antiquated practice. The decoction of ginger rhizome is generally utilized in Ayurvedic medication. Rasapanchak of of dried and fresh form of *Zingiber officinale* are shown in Table 3 and 4.

Table 3. Rasapanchak of *Zingiber officinale* (Shunthi dried form) as per Ayurveda

Sanskrit	Sanskrit/English
Veerya/ Potency	Ushana/ Hot
Vipak/ Metabolic property	Madhur/Sweet
Guna/ Physical property	Laghu/ Small and Sanigadh/ Oily
Rasa/Taste	Kattu/Pungent

Table 4. Raspanchak of *Zingiber oficinalle* (Adrak fresh form) as per Ayurveda

Sanskrit/English	Sanskrit/English
Veerya/Poywncy	Ushana/Hot
Vipak/Metabolic property	Kattu/Pungent
Guna/Physica property	Guru/Heavy, Ruksha/Dry, Tikshan/Strong
Rasa/Taste	Kattu/Pungent

It is kapha and vatta sedative. It is utilized topically as well as internally. It is useful against cough, hicckups, rhinitis etc. It is a good stamina booster. It is effective against skin disorders like sheetpitt, shalipad. Shunthi churna is effective against chronic typhoid. It is effective against aamvat (rheumatois arthritis). Various ayurvedic formulations of shunthi/adrak: Arakkhand, samsharakchurna, rasnadikwath, saubhagyashunthi, shunthisura, shunthipanak.

Properties and uses of *Zingiber officinale* (Ginger)

Deepani: Improves appetite
Bhedini: Treats constipation
Ruchya: Used as appetizer
Jihwa kanta vishodhanam: It clears the tongue and throat
Anulomana: Maintains the circulation
Hrudya: Protects the heart
Pachana: Improves the digestion
Vrishya: Provides nutrition
Swarya: Good for voice
Kasahara: Reduces cough
Swasahara: Vanishes asthma
Sulahara: Acts as an analgesic
Grahi: Retention of water through gut
Sheeta Prashamana: Reduces cold
Shotha Hara: Anti-edematous
Vedana Sthapana: Pain killer
Nadi Uttejaka: Stimulates the CNS
Truptighna: Reduces thirst
Vatanulomana: Restores the proper circulation
Shoola Prashamana: Pain relief
Arshoghna: Reduces hemorrhoids
Jwaraghna: Lowers down the temperature
Sleshma Hara: Reduces stagnate mucous (41,42,43,44,45)

Modern View on *Zingiber officinale:* In modern times the quality of herbal drugs is being compromised by factors like contamination, adulteration, and misidentification. These factors directly affect the heath of patients by causing some serious harms to the body. Contaminants like heavy metals, pesticides, microbes and mycotoxins have been detected in the herbal drugs. Mercury, arsenic, and lead are the most common heavy metal contaminants found in herbal medicines like Chinese patent medicines (CPMs) and Indian Ayurvedic medicines (IAMs). Cadmium, copper and thallium have also been detected from herbal drugs (46,47,48,49,50,51,52). Adulteration is a common practice of degrading the herbal drugs. Herbal drugs are adulterated by either adding orthodox drugs or by substituting fake or inferior products, or by adding foreign particles (non-officinal herb parts, sands, metals) (53,54,55). This problem is mainly faced by countries like China and India, where herbal medicines are largely used. This may be the drawback of Global herbal drug market (56,57,58). The detection of these adulterants and contaminants is important for the quality of herbal drugs. While in case of traditional herbal medicines, there are no associated side effects and they are free from contamination and adulteration. The herbal Ayurvedic formulations of *Zingiber officinalle* are effective against many ailments and cause no harm to the body. So, instead of using modern degraded herbal drugs, it's better to use traditional herbal drugs.

Therapeutic uses of *Zingiber oficinale:* *Zingiber oficinale*has diverse nature of phytochemicals which are responsible for its various therapeutic properties. Some its therapeutic properties are discussed below.

Gastro-protective: The findings of an *in-vivo* study on male wistar rats having artificially induced gastric ulcer by ethanol, suggested that zingerone has a gastroprotective effect (59).

Anti-viral: Ginger is effective against viruses. As per the report of a clinical study, fresh ginger has a significant inhibitory impact on Human respiratory syncytial virus (HRSV) (60).

Hepato-protective: The hepato-protective activity was checked in rats having artificially induced intoxication by carbon tetrachloride. It was found that the methanolic extract of *Zingiber officinale* was effective against the intoxication. It significantly restored the changes which were caused by carbon tetra chloride (61).

Anti-bacterial: Anti-bacterial potential of *Zingiber officinale* was checked against gram positive and gram negative bacterial species. *Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus pyogens* were the gram positive species of bacteria while the gram negative species were Pseudomonas *aeruginosa, Klebsiella pneumonia, Proteus mirabilis.* It was found that the ethanol extract was more potent against both the gram positive as well as gram negative bacterial species than the aqueous extracts of Ginger (62).

Anti-diabetic: The findings of *in-vivo* study carried out in streptozotocin-induced diabetic rats demonstrated that the aqueous extract of *Zingiber officinale* exhibits properties like hypoglycaemic, hypocholesterolaemic and hypolipidaemic (63). Another *in-vivo* study on alloxan-induced and insulin-resistant diabetic male rats suggested that aqueous extracts of *Zingiber officinale* is associated with hypoglycaemic property (64).

Neuroprotective: Neuroprotective activity of *Zingiber officinale* was checked in monosodium glutamate (MSG) - induced neurotoxicity in male albino rat. The root extract significantly restored all the changes that had been caused by

the induction of MSG. This suggested that ginger exhibits a neuroprotective activity against MSG (65).

Anti-ulcer: Hydroalcoholic extract of *Zingiber officinale* were evaluated against duodenal ulcer induced by cysteamine in rats. It was found that hydroalcoholic extract had protective impact against the duodenal ulcer (66).

Anti-oxidant: The anti-oxidant activity of *Zingber officinale* was evaluated in an *in-vitro* study by 2, 2'-Diphenyl-1-picrylhydrazyl (DPPH) Radical Scavenging Method which suggested that ginger is associated with anti-oxidant property (67).

Anti-inflammatory: The *in vivo studyconducted in* male Sprague-Daw-ley rats having artificially induced arthritis in right knee and right paw by injecting 0.05 ml of a fine suspension of dead *Mycobacterium tuberculosis* bacilli in liquid paraffin (5 mg/ml), to check the anti-inflammatory activity of *Zingiber officinale* suggested that ginger oil has significant anti-inflammatory and anti-arthritis activity (68).

Conclusion

The utilization of herbal substances to treat various ailments is a very old practice and it has prompted the discovery of the greater part of all modern drugs. Medicinal herbs play a central role in all the medicine systems for treating several diseases. The phytochemical constituents of these plants are associated with wide range of therapeutic properties. *Zingiber officinale* is globally used medicinal herb. Various researches and available literatures reveals that *Zingiber officinale* is utilized as a solution for relieving hypertension, anti-microbial, neuroprotective, hepatoprotective, gastrointestinal problems, anti- cancer etc. shows the significance of this plant.

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