



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating 2017: 5.03
TPI 2017; 6(10): 22-27
© 2017 TPI
www.thepharmajournal.com
Received: 06-08-2017
Accepted: 07-09-2017

Yogeshwar Sharma
Associate Professor, Department
of Chemistry, Motilal Nehru
College, Benito Juarez Marg,
University of Delhi South
Campus, New Delhi-110021,
India

Ginger (*Zingiber officinale*)-An elixir of life a review

Yogeshwar Sharma

Abstract

Ginger (*Zingiber officinale*) is a herbaceous perennial plant of the family *Zingiberaceae* which used as a spice, food, flavouring agent, and medicine. It has a pH of 5.6 to 5.9, similar to that of figs, fennel, leeks, parsnips and lettuce. The alkalinity of foods depends on many variables, including growing conditions and processing. To make old and rotten ginger attractive, it is washed with sulphuric acid which is extremely unsafe to consume and can result in kidney stones, affect the liver, stomach burns, etc. The storage condition for fresh *Ginger* includes a temperature of 13 °C and at relative humidity of about 65%. The various chemical constituents and their structures are discussed in this review. *Ginger* offers substantial protection from stroke and heart attack because of its ability to help prevent blood clotting. It is also used as Antioxidant, Antitoxic, Eicosanoid balance, Enzyme activity, Probiotic support, Serotonergic, Systemic stimulant. Some of the market preparations containing Ginger (Shunth) are pachanol, Hajmola, Hingoli, garam masala, chana masala, dristi eye drops, chaat masala, divya churna, aloo bhujia, pav bhaji masala, shahi paneer masala, etc.

Keywords: Ginger, Macroscopy, microscopy, chemical constituents, medicinal uses, market preparations

1. Introduction

Ginger (*Zingiber officinale*) is a herbaceous perennial plant of the family *Zingiberaceae*, used as a spice, food, flavouring agent, and medicine. Its generic name *Zingiber* is derived from the Greek *zingiberis*, which comes from the Sanskrit name of the spice, *singabera*. The Latin name, *Zingiber*, means "shaped like a horn" and refers to the roots, which resemble a deer's antlers. Long cultivated by the ancient Chinese and Hindus, *Ginger* was one of the first oriental spices known in Europe. Throughout the early centuries, *Ginger* was thought to have medicinal powers. It was often used by pregnant women for morning sickness. The spice has a slightly biting taste and is used, usually dried and ground, to flavour breads, sauces, curry dishes, confections, pickles, and *Ginger* ale. Its fresh rhizome is used in cooking. It is most alkaline-promoting foods. It has a pH of 5.6 to 5.9, similar to that of figs, fennel, leeks, parsnips and romaine lettuce. The alkalinity of foods depends on many variables, including growing conditions and processing.

To make old and rotten ginger attractive, it is washed with acid to brighten them up because the customer chooses only those who look attractive. Sulphuric acid is added to ginger to make them appear shiny and almost double their weight. Vegetable vendors are making quite a profit out of this as people generally get pleased by the appearance of the adulterated ginger and purchase them. Sulphuric acid is extremely unsafe to consume and can result in kidney stones, affect the liver, stomach burns, etc. It is advisable to be careful while buying ginger and be cautious while buying ginger which looks shiny and polished. The most important advice is to wash the ginger with plenty of water before cooking so as to remove these toxic chemicals from them and make it safe for consumption¹⁻⁵.

Dried *Ginger* rhizomes are irregular in shape, branched or palmate. Their colour varies from dark yellow or light brown to pale buff. It contains about 2 percent essential oil which is the principal component is zingiberene and the pungent principle of the spice is zingerone. The oil is distilled from rhizomes for use in the food and perfume industries. Over the past 10-15 years there has been an increasing interest in the incorporation and use of various traditional herbs or plant extracts in conventional medicine. Many of these herbs and plant extracts are based on what has been used as part of traditional medicine systems and there is a large body of anecdotal evidence supporting their use and efficacy. One of the problems is a lack of good clinical data from randomized clinical trials and the other is that while in practice many of these compounds are used as complex mixtures, laboratory based experiments tend to focus on one or more selected chemicals within that mix.

Correspondence

Yogeshwar Sharma
Associate Professor, Department
of Chemistry, Motilal Nehru
College, Benito Juarez Marg,
University of Delhi South
Campus, New Delhi-110021,
India

Hence it is often difficult to extrapolate from laboratory-based experiments to use in a clinical setting. One compound that has undergone considerable investigation both at the clinical trial and basic science level is *Ginger*, and this review presents what is currently known about the medicinal uses of *Ginger*.



Ginger without acid or base wash



Ginger bleached with acid wash



Dry Ginger (Sonth)

Occurrence

Ginger is a large tuberous perennial plant which is cultivated extensively in almost all tropical and subtropical countries like India, China, Africa, and Australia. India and China are the world's leading producers of *Ginger*⁴. The material of commerce is supplied in "completely scraped" (peeled), "partially scraped," or "unpeeled" rhizomes. Peeled rhizomes ("white" *Ginger*) are produced in Jamaica, while unpeeled rhizomes ("black" *Ginger*) are mainly from China and Sierra Leone. Partially scraped rhizomes come from India, Nigeria, Australia, and Japan. *Ginger* became naturalized in the Caribbean and Central America early in the sixteenth century when Spaniards brought it from the East Indies and began to cultivate it on a large scale for export to Europe.

Vernacular Names

In India

Hindi	:	Adrak (Fresh), Sonth (Dried)
Assami	:	Ada
Bengali	:	Ada
Oriya	:	Ada, Adraka
Tamil	:	Ingee
Gujrati	:	Adhu(Fresh), Sunth, Shuntya
(Dried) Malayalam	:	Inchi
Marathi	:	Sunth, Shuntya (Dried), Alha
(Fresh) Urd	:	Adraka
Telugu	:	Allam
English	:	Ginger

Outside India

Japanese	:	Shoga, Myoga
Sanskrit	:	Adraka (Fresh), Shunthi (Dried), Shringaveran, Sringaaran
Spanish	:	Jengibre
English	:	Ginger
Russian	:	Imbir
German	:	Ingwer
Swedish	:	Ingefara
Farsi	:	Amveel, Zanjabil
Dutch	:	Gember
French	:	Gingembre
Chinese	:	Jeung, Sang Keong, San Geung, Chiang, Jiang, Keong

Various species of *Zingiber* and its distributions

<i>Z.chrysanthum</i>	:	Tropical Himalayas
<i>Z.rubens</i>	:	Khasia Hills, Bengal
<i>Z.wightianum</i>	:	Travancore; abundant in the Anamallay forests, Ceylon: common in the forest up to 4000 ft.
<i>Z.offkinale</i>	:	Widely cultivated in Tropical Asia.
<i>Z.intermedium</i>	:	North Khasia Hills; at Bhorlasa, alt. 3500 ft. <i>Z.spectabile</i> : Malacca, Perak.
<i>Z. casumunar</i>	:	From the Himalayas to Ceylon and Malay Peninsula.
<i>Z.clarket</i>	:	Sikkim Himalayas; Altitude: 3000-5000 ft.

Cultivation and Harvesting

The cultivation of *Ginger* (otherwise known as *Zingiber officinale*) started in Nigeria in 1927 and the country became

one of the major world producers of this plant. It is a root crop widely consumed in Nigeria either for culinary purposes or for manufacturing and other purposes. It has a short growth cycle of about 8 months or less, before harvesting. It can either be planted alone or inter-cropped with some other crops like yam. The crop can be planted during the early rains of April and May. Flowering of the root crop occurs about six months after planting, and as soon as the leaves have dried off, the crop is ready for harvesting. Mostly, the root is often grown on ridges for easier harvesting. Most farmers will normally clear and plant on new land planting of about 8cm deep on small ridges and mulching with a thick layer of leaves, immediately after planting. For optimum yield level, *Ginger* requires rich organic soil or valley clay that is well drained. Ultimately an annual rainfall level of about 1020 mm has been proven to be adequate for this crop to thrive well otherwise, an annual rainfall level of 760 mm with supplementary irrigation will be required. The crop will thrive well at any altitude up to 1200 m above sea level.

The stems of the plant grow about a meter high. The leaves are 6 to 12 inches long, elongate and the flowers are cone like spikes about 1 inch thick and 2 to 3 inch long composed of overlapping green bracts, which may be edged with yellow. Each bract encloses a single, small, yellow-green and purple flower. Growing *Ginger* requires a warm and moist climate with ample sunshine and heavy rainfall. The plant is propagated by dividing and planting the root-like structures called rhizomes. After about a full year of growth, the rhizomes are dug up, washed, and laid in the sun to dry for about eight days. *Ginger* is propagated by planting rootstalk cuttings. Its harvesting is done by lifting the rhizomes from the soil, clean them, and drying them in the sun.

Collection

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*.

Storage Requirements

Fresh *Ginger* rhizomes suffer from rapid post-harvest deterioration either as a result of poor handling or rot due to micro-organisms and physiological breakdown due to sprouting. Good quality *Ginger* roots should be big, firm and without defects of any kind like soft spots, peeled skin, cuts, bruises and scratches. The storage condition for fresh *Ginger* includes a temperature of 13 °C and at relative humidity of about 65%. Under this condition, *Ginger* could be stored for an average of 6 months. In the case of the storage of *Ginger*

under room conditions, the crop shrivels and may sprout, thereby reducing the storage life to about 1 month. For dry *Ginger*, the recommended storage condition is room temperature of between 22 to 25 °C and with a relative humidity of 70% in order to maintain a shelf life of about 12 months.

Macroscopy

Morphological characters of *Ginger* plant are

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.

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

Flowers: 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.

Morphological Characters of *Ginger* Rhizome

General appearance: Sympodial branching, horizontal rhizome.

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.

Surface: Longitudinally striated with occasional projecting fibers.

Fracture: Short, starchy, fibrous.

Fractured surface: Shows a narrow bark, a well marked endodermis and a wide stele, showing numerous scattered grayish points (fibro-vascular bundles) and smaller yellowish points (secretion cells)

Colour: Buff.

Odour: Aromatic.

Taste: Pungent.

Microscopic characters of *Ginger* Rhizome

Cork: Outer zone consists of irregularly arranged cells and inner zone consists of cells arranged in radial rows. Cork is absent in *Jamaica Ginger*.

Phellogen: It is indistinct.

Cortex: Cortex consists of thin walled, cellulosic rounded parenchyma with intercellular spaces. These cells contain simple, ovate or sac-shaped starch grains with hilum at the pointed end. Cortex contains closed collateral fibro-vascular bundles. Some cells contain yellow brown oleo resin.

Endodermis: It is distinct and consists of tangentially elongated cells containing suberin in radial walls. Starch is absent.

Stele: Below the endodermis is a ring of vascular bundles without fibres. The remaining tissue contains fibro-vascular bundles, starch and oleo resin cells similar to cortex.

Microscopy

The powdered form of dried *Ginger* is pale yellow to cream in colour with a pleasant, aromatic odour and a characteristic and pungent taste. The diagnostic characters are:

Abundant starch granules: These are mostly simple, fairly large, flattened, oblong to sub rectangular to oval in outline with a small point hilum situated at the narrower end; in frequent granules show very faint transverse striations. Compound granules with two components occur very rarely.

Fibres: It is usually occur in groups and may also be found associated with the vessels; they are fairly large and one wall is frequently dentate; the walls are thin and marked with numerous pits which vary from circular to slit-shaped in outline; very thin transverse septa occur at intervals. The fibres give only a faint reaction for lignin.

Vessels: They are large and occurs in small groups associated with the fibres; they are reticulately thickened, frequently showing distinct, regularly arranged rectangular pits, and are often accompanied by narrow, thin walled cells containing dark brown pigments; a few smaller, spirally or annularly thickened vessels also occur. All the vessels give only a faint reaction for lignin.

Oleo-resin cells: In unclear preparations, these are seen as bright yellow ovoid to spherical cells occurring singly or in small groups in the parenchyma.

Abundant parenchyma: It is composed of thin walled cells, rounded to oval in outline with small intercellular spaces; many of the walls are characteristically wrinkled; the cells are filled with starch granules or oleoresin. Very occasional groups of parenchyma are associated with thin walled tissue composed of several rows of collapsed cells⁶⁻⁷.

Chemical constituents

Some of the major chemical constituents⁸⁻¹² and their structures are:

Volatile oils (1 to 2%): bisabolene, gingerol, citral, citronellal, geranial, linalool, limonene, camphene, borneol, cineole, phelandrene, zingiberene.

Bisabolene: It is a sesquiterpene.

Zingiberene (6%): sesquiterpene hydrocarbon. **Phenols:** gingeol, zingerone.

Gingerol: A yellow pungent oily liquid and yields

Zingerone, a ketone and aliphatic aldehyde.

Oleo-resin: shogaol, zingiberole.

Shogaol: It is formed by loss of water from **Gingerol**.

Zingiberole: sesquiterpene alcohol.

Lipids (1 to 2%): free fatty acids, lecithins, phosphatidic acid,

triglycerides.

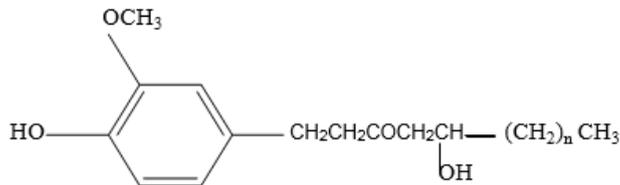
Vitamins: A, B₃(niacin), B₆(riboflavin), C.

Minerals: calcium, magnesium, phosphorus, potassium.

Proteins (2 to 3%)

Starch (50%)

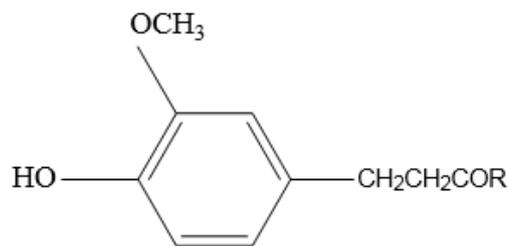
The pungency of *Ginger* is due to alcoholic group of the oleoresin which is *gingerol* (5 to 8%). The aroma of *ginger* is due to volatile oils (1 to 2%) which are *bisabolene*, *zingiberene* and *zingiberol*. The structures of some of the major chemical constituents of *ginger* along with their IUPAC names are



Where n= 3, 4, or 5

Gingerol

IUPAC NAME: 5-hydroxy-1-(4-hydroxy-3-methoxyphenyl)-3-decanone

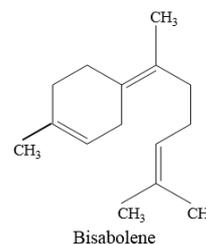


Zingerone: R=CH₃

IUPAC NAME: 4-(4-hydroxy-3-methoxyphenyl)-2-butanone

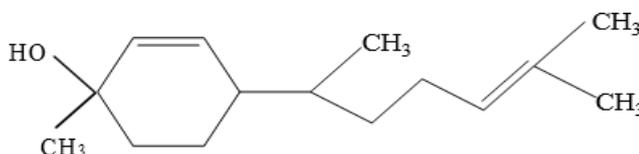
Shogaol: R= -CH=CH (CH₂)₄-CH₃

IUPAC NAME: 1-(4-Hydroxy-3- methoxyphenyl) dec-4-en-3-one



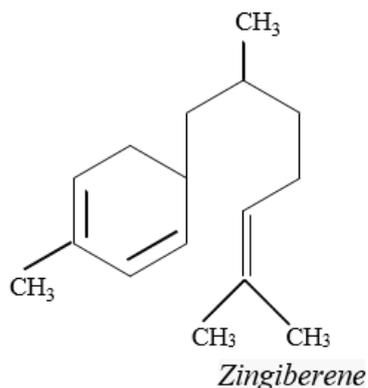
Bisabolene

IUPAC NAME: 1-Methyl-4-(6-methylhept-5-en-2-ylidene) cyclohex-1-ene

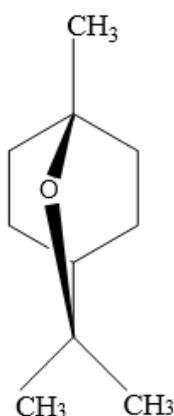


Zingiberenol

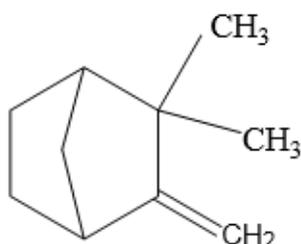
IUPAC NAME: 1-methyl-4-(6-Methylhept-5-en-2-yl) cyclohex-2-enol



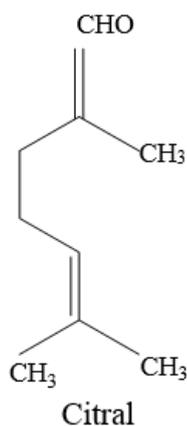
IUPAC NAME: 2-Methyl-5-(6-methylhept-5-en-2-yl) cyclohexa-1,3-diene



IUPAC NAME: 1, 3, 3-Trimethyl-2-oxabicyclo [2, 2, 2] octane



IUPAC NAME: 2, 2-Dimethyl-3-methylidenebicyclo [2.2.1] heptane



IUPAC NAME: 3, 7-dimethylocta-2,6-dienal

Medicinal Uses and Some Market Preparations

Arthritis: It reduces inflammatory eicosanoids without the side effects of other anti-inflammatory drugs and NSAIDs.

Heart and circulatory problems: *Ginger* offers substantial protection from stroke and heart attack because of its ability to help prevent blood clotting. Studies have shown that it deactivates the harmful activity of the so-called "*bad eicosanoids*" hormones, which are responsible for blood clotting, constriction of the vessels, and inflammation. In addition to the above, its antioxidant constituents strengthened the cardiac muscle and also lowers serum cholesterol levels by interfering with cholesterol biosynthesis.

Fever reducer: It can assist in lowering a fever. Its antibacterial/antiviral effects helps to reduce the incidence of colds altogether.

Digestive problems: It is commonly used for indigestion because it absorbs and neutralizes toxins in the stomach. It also improves the production and secretion of bile from the liver and gallbladder. Bile aids in the digestion of fats, which helps to *lower cholesterol levels*.

It is sometimes recommended as an alternative to aspirin for people who cannot take aspirin because of its irritating effect on the gastrointestinal tract.

It is also used as Antioxidant, Antitoxic, Eicosanoid balance, Enzyme activity, Probiotic support, Serotonergic, Systemic stimulant

Its demonstrated effects are Analgesic, Antibacterial, Antidiabetic, Antiemetic, Antifungal, Anthelmintic, Anti-inflammatory, Antithrombic, Antitumor, Antitussive, Antiulcer, Antiviral, Gas or flatulence, Headaches, Immune supportive, Migraine Headache, Morning sickness, Nausea, Sinus congestion, Thermoregulatory, etc.

Some of the market preparations containing *Ginger* (Shunth) are pachnol, Hajmola, Hingoli, garam masala, chana masala, dristi eye drops, chaat masala, divya churna, aloo bhujia, pav bhaji masala, shahi paneer masala, etc.

References

1. Glossary of Indian Medicinal Plants; By R.N. Chopra, S.L. Nayyar & I.C. Chopra Published by Council of Scientific & Industrial Research, New Delhi.
2. www.naturallifeenergy.com/health-benefits-of-ginger.
3. <https://www.livestrong.com/article/ginger>.
4. Atlas of Microscopy of Medicinal Plants, Culinary Herbs and Spices; By Betty. P. Jackson & Derek. W. Snowdown.
5. Plants Diseases; By R.S. Singh, II Edition, Published by Oxford & IBH Publishing Company, New Delhi.
6. Encyclopedia Of Common Natural Ingredients Used In Food, Drugs & Cosmetics; By Alborn Y. Lewng, Consultant, Natural Products, Glen Rauk, New Jersey.
7. Trease & Evans Pharmacognosy; By Williams Charles Ewans, 14 Edition, Published by Harcourt brace & Company Asia Pvt. Ltd.
8. Spices; By Henry N. Ridely, Published By International Book Distribution, Dehradun, Reprint 1983.
9. The Pictorial Encyclopedia of Plants & Flowers; By F.A. Hofak, Edited BY J.G. Borton American Consultant, H.W. Rickett
10. Herbal Drugs & Phytopharmaceuticals; (A Hand Book for Practice on a Scientific Basis) Edited & Translated from the German Edition by Norman Greigner Bisset, London. German Edition Edited by Man. Wichil, Marbey Published By Scientific Publishers, Strulgtout 1994.

11. "Ginger: Health Benefits, Facts, Research." *Medical News Today*. MediLexicon, Intl., 5 Jan. 2016. Web. <http://www.medicalnewstoday.com>, Megan Ware RDN LD.
12. <https://www.wikipedia.org>