

## Zanjabeel (*Zingiber officinale* Roscoe.)—A concise review on culinary spice with its potential therapeutic applications

Arjumand Naaz<sup>1\*</sup>, Uzma Viquar<sup>2</sup>, Ansari Umme Ammara<sup>3</sup>, Juveria Jabeen<sup>3</sup>, Ahmed Minhajuddin<sup>4</sup>

<sup>1</sup> PG Scholar, Department of Ilmul Advia (Pharmacology), National Research Institute of Unani Medicine for Skin Disorders, Hyderabad, Telangana, India

<sup>2</sup> Associate Professor, Department of Ilmul Advia (Pharmacology), National Research Institute of Unani Medicine for Skin Disorders, Hyderabad, Telangana, India

<sup>3</sup> PG Scholar, Department of Moalajat (Medicine), National Research Institute of Unani Medicine for Skin Disorders, Telangana, India

<sup>4</sup> Director In-Charge, National Research Institute of Unani Medicine for Skin Disorders, Hyderabad, Telangana, India

### Abstract

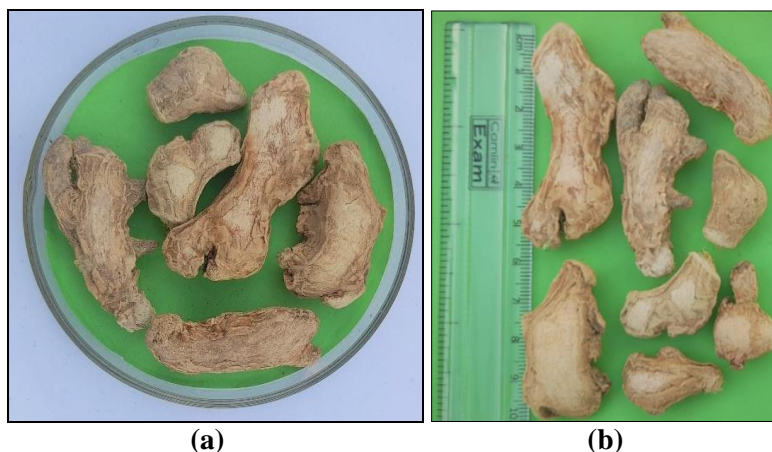
Evolution of mankind and medicine has been a universal and constant bonding since the beginning and keeps on growing timely with different modulation and development. The various indigenous systems have been developed to treat different ailments by using plants such as Unani, Ayurveda, Siddha and Homeopathy etc. The Unani (Greco-Arab) system of medicine has been practiced since ancient times for the treatment of a range of diseases. The Unani system of medicine has 'holistic' approach where physical, mental, spiritual and social well-being of an individual have been treated, whereas modern medicine, on the other hand are relatively more focused on particular diseases based on specific aetio-pathological entities. The medicinal value of herbal drug estimation is between 70% -90%, because the majority of citizens in the developing countries are using traditional medicine for the management of health care needs and concerns. Medicinal plants play an important role in the development of potent therapeutic agents. It is estimated that 25% of all modern medicines are derived, either directly or indirectly from medicinal plants, primarily through the application of modern technology to traditional knowledge. Ginger (*Zanjabeel*) is potentially famous herbal drug which has been widely used as a culinary spice as well as drug in traditional medicine. This article aims at reviewing the Zanjabeel (*Zingiber officinale* Roscoe) on the basis of its description, botanical identification, habitat, cultivation & collection, chemical constituents, therapeutic potential in various diseases and evidence based pharmacological studies.

**Keywords:** Unani, Greco-Arab, Zanjabeel, *Zingiber officinale* Roscoe, therapeutic potential, pharmacological studies

### Introduction

*Zingiber officinale* Roscoe. is an important medicinal plant, belonging to the family Zingiberaceae <sup>[1]</sup>. It is described as root like underground stem known as rhizome, spreads underground, commonly used in food products. The fresh rhizome is called Adrak (*Zanjabeel-e-Ratab*) and dried one is known as Sonth (*Zanjabeel-e-Yabis*). It has characteristic aromatic odour and taste. Rhizomes are thick, pale yellow

with different sizes and shapes. India is the largest producer of ginger in the world. The rhizomes are esteemed as spice for its characteristic pungent odour and widely used for the flavoring foods, for the extraction of oleoresins, preparation of extracts and distillation of an essential oil. It is a well-known drug and spice which is widely used as a single as well as ingredient in various Unani formulations to treat number of diverse pathological conditions <sup>[2]</sup>.



**Fig 1:** (a) and (b) shows *Zingiber officinale* Roscoe (Zanjabeel- Ginger) Vernacular names: <sup>[1-3]</sup>

**Table 1**

English	:Ginger
Hindi	:Sonth, Adrak
Urdu	:Sonth, Zanjabeel
Arabic	:Qafeer, Zanjabeel
Persian	:Sahangrez, Zanjabil
Sanskrit	:Naara, Visva, Adraka, Anupama, Ardrashaka,
Bengali	:Ada
Kannada	:Hasisunti, Shunth
Tamil	:Allam, Inji
Telugu	:Allamu, Sonthi
Gujarati	:Sunth, Sundh
Kashmiri	:Sho-ont
Malayalam	:Andrakam, Inchi
Marathi	:Ale
Oriya	:Oda, Sunthi
Punjabi	:Adrak, Sonth

**Table 2:** Taxonomical Classification: [4-5]

Kingdom	Plantae
Subkingdom	Tracheobionata
Subdivision	Spermatophyta -seed plants
Division	Magnoliophyta – Flowering plants
Class	Liliopsida - Monoliophyta
Sub Class	Zingiberidae
Order	Zingiberales
Family	Zingiberaceae – Ginger family
Genus	Zingiber P. Mill – ginger
Species	Officinale

**Botanical description**

*Zingiber officinale* Roscoe. herbaceous, perennial aromatic plant grows horizontally with erect leafy stems and several sympodial lateral tubers. An elongated erect leafy shoot, 60-120cm height. Leaves are narrow distichous subsessile on the sheaths, linear lanceolate, 1-2cm wide, glabrous. Flowers are greenish with small dark purple or purplish black lip in radical spikes 3.8-7.5 cm long and 2.5cm peduncles 15-30 cm long stamens dark purple as long as the lip. It is cultivated in open fields [6-9].

**Habitat and Distribution**

It occurs naturally in the Pacific Islands and widely cultivated in different countries, like India, Caribbean Island, Africa, Australia, Taiwan, Japan, China, Nigeria and Jamaica. Ginger is cultivated in almost all the states of India including Kerala, Assam, Himachal Pradesh, Orissa, West Bengal, Karnataka, Sikkim, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh and Mizoram [10].

**Cultivation and Collection:** For cultivation of ginger Sandy or clay or red loamy soil rich in humus and warm humid conditions are ideal. It is cultivated in heavy rainfall areas, even at the sea level best at an altitude of 1000-1500 meter. Harvesting is done by digging the rhizome, washed properly and then dried to improve the color & to prevent its further growth, then scrapped dried and coated with inert material like calcium sulphate [10].

**Macroscopic Features:** Rhizome is laterally compressed bearing short, flat, ovate, oblique branches on upper side each having at its apex a depressed scar, pieces are about 5-15 x 1.5-6.5 cm, externally buff colored, having aromatic and agreeable and aromatic smell showing longitudinal

fracture short, smooth, transverse surface exhibiting narrow cortex, a well-marked endodermis and a wide stele showing numerous scattered fibro-vascular bundles and yellow secreting cells. Longitudinal striations and occasional projecting fibers are present on the surface of ginger [10].

**Microscopic Features:** Transverse section of rhizome shows cork consists of irregularly arranged cells, followed by cortex. Cortex is made up of thin walled parenchymatous tissue. Endodermis is well marked and distinguishes the stele and the cortex. Cortical tissue encloses several closed collateral fibro-vascular bundles. Vascular bundles just inside the endodermis are free of fibers. Oleo-resinous cells and starch grains are found throughout the ground tissue. Endodermis is free of starch [10].

**Chemical constituents:** Chemical constituent of *Zingiber officinale* varies according to agro-climatic condition green/fresh ginger gives water 80.9 %, protein, fat, fiber, carbohydrate (starch, pentosans), minerals (Ca, P, Fe), trace of iodine and fluorine, vitamin (thiamine, riboflavin, niacin, Vitamin C, carotene), fructose, sucrose, raffinose in trace. Major chemical constituents are 6-shogaol, 6-gingerol, zingiberol,  $\beta$ -phellandrene,  $\alpha$ -zingiberene, ar-curcumene,  $\beta$ -bisabolene. Other chemical constituents Gingerenones A, B & C, isogingerenone B, hexahydrocurcumin, diarylheptanoids, gingerdiols, 6-gingesulfonic acid, gingerglycolipids A, B & C, gingerenones, (+)-angelicoidenol-2-O- $\beta$ -D-glucopyranoside, geraniol glycosides,  $\alpha$ -santalol,  $\beta$ -eudesmol, nerolidol, farnesol, elemol, neral, geranial,  $\alpha$ - and  $\beta$ -pipene, camphene, sabinene, myrcene, limonene, 1,8-cineole, aliphatic alkanes, alcohols, aldehydes, ketones, sulfides [4].

**Parts Used**

Root (Rhizome) [11-14].

**Therapeutic Actions (Af'āl)**

*Zingiber officinale* shows chief pharmacological actions such as *Muħallil-e-Riyah* (Carminative) [6,11], *Hazim* (Digestive), *MushtahiTu'am* (Appetizer), *Muqawwi-e-Mida-wa-Kabid* (Tonic for liver and stomach) *Mulayyin* (Laxative), *Muharrrik* (Stimulant), Aromatic [6,11]. It also acts as *Mudirr-e-Luab-e-Dehn* (Sialagogue), *Muhammir* (Rubefacient), *Musleh Advia* (Corrective), *Daf'-e-Qurooh* (Antiulcer) [11,15] *Mufatteh Sudad-e-Jigar* (Deobstruent of liver), Circulatory Stimulant [4] *Muqawwi-e-Bah* (Aphrodisiac), *Muqawwi-e-Basar* (Eye Tonic), *Muqawwi-e-A'sab* (Nervine Tonic), *Muħallil-e-Warm* (Anti-inflammatory), *Muqawwi-e-Hafiza* (Memory Enhancer), *Mujaffif-e-Ruħūbat* (Desiccant), *Munaffis-e-Balgham* (Expectorant), *Mushil-e-Balgham* (Phlegmagogue), *Daf'-e-Qai* (Antiemetic) 'Asir (Squeezing) *Moa'rriq* (Diaphoretic), *Qatil-e-Dīdān* (Anthelmintic), *Muwallid-e-Mani* (Spermatogenic), *Muqawwi-e-Dimagh* (Brain Tonic). Further it shows Antiplatelet, Anti-bacterial, Anti-fungal actions [1].

**Therapeutic uses (Istemaal):**

*Zingiber officinale* is used in number of pathological conditions such as *Fasād al-Haḍm* (Dyspepsia), *Dard-e-Shikam* (Pain in abdomen), *Nafkh* (Flatulence), *Za'f-e-Ishthā* (Anorexia), *Amrāḍ-e-Ain* (Diseases of eyes), *Amrāḍ-*

*e-Uzn* (Diseases of Ear), *Waja'al-Uzn* (Otagia). It is also helpful in many musculoskeletal conditions such as *Niqris* (Gout), *Hudār* (Rheumatism), *Istisqā* (Dropsy), *Diq al-Nafas* (Asthma), *Suda* (Headache), *Shaqīqa* (Migraine), *Amrād-e-Sadar* (Chest Disorders), *Iltihāb al-Shu'ab* (Bronchitis), *Nisyān* (Dementia), *Riyāhi Bawāsīr* (Piles), *Surfa* (Dry Cough), *Bah't ul Sawt* (Hoarseness of voice), *Nazla* (Colds or Catarrhal Attacks), *Taqfir-e-Bawl* (Incontinence of Urine), *Falij* (Paralysis), *Waja'al Qutn* (Lumbago), *Da' al-Fil* (Elephantiasis). It is also used in medical conditions such as *Da'usSalab* (Alopecia), *Yaraqān* (jaundice), *Sailan-ur-Reham* (Leucorrhoea), *Ihtibās-e-Tamth* (Amenorrhoea), *Ziabetus* (Diabetes), *Laqwa* (Facial palsy), *Ghathayān* (Nausea) [1, 4, 6, 11, 15].

#### Miqdār-e-khūrāk (Dose)

1 to 1 ½ gm, can be given up to 7 gm [1, 11].

#### Muzir (Adverse effect)

*Amrād-e-Halaq* (Diseases of throat). Person having hot temperament [11].

#### Musleh (Corrective)

Roghan-e-Badam (Almond oil - *prunus amygdalus*, Batsch.) and Shahed (Honey) [11].

#### Badal (Substitute)

Dar filfil (*Piper Longum*, Linn.) [11]

#### Evidence based Pharmacological studies

**Serum and Hepatic Cholesterol Lowering Activity:** A study has carried out in which ginger oleoresin when administered orally significantly lowered serum and hepatic cholesterol and increased fecal cholesterol excretion [16].

**Nutraceutical Agent against Liver Fibrosis:** Ginger rhizomes successive extracts (petroleum ether, chloroform and ethanol) were examined against liver fibrosis induced by carbon tetrachloride in rats. Treatments with the selected extracts significantly increased GSH (Glutathione), SOD (superoxide dismutase), SDH (Sorbitol dehydrogenase), LDH (Lactate dehydrogenase), G6-Pase (Glucose-6-phosphatase), AP (Alkaline phosphatase) and 5'NT (5'-nucleotidase). However, MDA (Plasma Malondialdehyde), AST (aspartate aminotransferase), ALT (alanine aminotransferase) ALP (Alkaline phosphatase), GGT (Gamma-glutamyl transferase) and total bilirubin were significantly decreased. Extracts of ginger, particularly the ethanol one, resulted in an attractive candidate for the treatment of liver fibrosis induced by CCl<sub>4</sub> [17].

**Anti-Inflammatory and Analgesic Activity:** The rhizome extract of *Zingiber officinale* was investigated for anti-inflammatory and analgesic properties in albino rats and Swiss mice respectively. The extract (50 and 100 mg/kg b.w) produced significantly (P<0.05) inhibition of the carrageenan – induced rat paw oedema and a reduction in the number of writhing induced by acetic acid in mice. The results show that rhizome extract of *Z. officinale* possesses anti-inflammatory and analgesic agent(s) [18].

**Spermatogenic Activity:** As an antioxidant's ginger has a useful effect on spermatogenesis and sperm parameters. In the study two groups of rats received ginger rhizome

powder (50 and 100mg/kg/day) for 20 consequence days. Animals were kept in standard conditions. On the twentieth day the testes tissue of Rats in whole groups were removed and sperm was collected from epididymis and prepared for analysis. Results revealed that administration of 100 mg/kg/day of ginger significantly increased sperm percentage, viability, motility and serum total testosterone [19].

**Antimicrobial and Cytotoxic Activity:** In a study, the edible plant *Zingiber officinalis* ethanol and chloroform extracts were prepared and their cytotoxic effects versus human cervical cancer (HeLa) and mouse fibroblast (L929) cell-lines were investigated [20].

#### Anxiolytic and Antiemetic Activity

The benzene fraction (BF) of a petroleum ether extract of dried rhizomes of ginger was screened for anxiolytic and antiemetic activity. Motor coordination was not affected by BF per se, but diazepam-induced motor incoordination was potentiated. Animals treated with BF showed decreased occupancy in the closed arm of the elevated plus maze suggesting the presence of anxiolytic principles in the BF. BF also blocked lithium sulphate - induced conditioned place aversion indicating antiemetic activity. The findings suggest that the fraction (BF) possesses anticonvulsant, anxiolytic and antiemetic activity, *Pseudomonas aeruginosa* ATCC 27853, and *Staphylococcus epidermidis* ATCC 12228 [21].

#### Cytoprotective and Anti-Ulcer Activity

Highly significant cytoprotective activity against Cyto-destruction produced by 80% ethanol, 0.6M HCl, 0.2M NaOH and 25% NaCl in albino rats is reported when 96% ethanolic extract of *Zingiber officinale* Rosc. was administered orally in dose of 500 mg/kg body weight after passing the starvation period of 36 hrs. Beside this extract of Ginger was reported to have protective effect against gastric ulcers induced by Nonsteroidal anti-inflammatory drugs (NSAIDs) and hypothermic restraint stress [22-23].

#### Antimicrobial activity

Antimicrobial activity of ethanolic extract of *Zingiber officinale* in concentration of 20 mg/ml was reported in study performed against *Pseudomonas aeruginosa* and *Escherichia coli*. Although the extract had negligible inhibitory activity against *E.Coli* most likely due to non-liberation of active constituents of raw extract [24].

#### Antifungal activity

Study of antifungal and anti-biofilm properties of ginger extract against *Candida* species indicate that ginger extract has good antifungal and anti-biofilm formation by fungi against *C. albicans* and *C. Krusei* [25].

#### Conclusion

The Present review article revealed the information about *Zanjabeel* (*Zingiber officinale* Roscoe.) which includes its introduction, nomenclature, vernacular names, taxonomical classification, botanical description, habitat and distribution, cultivation and collection, macroscopic and microscopic features, chemical constituents, therapeutic actions and its uses, therapeutic importance of ginger rhizome as evident by research performed on it. Evidence based

pharmacological studies revealed that it has Serum and Hepatic Cholesterol Lowering potential, Nutraceutical Agent against Liver Fibrosis, Anti-Inflammatory and Analgesic effect, Spermatogenic effect, Antimicrobial and Cytotoxic activity, Anxiolytic and Antiemetic effect, Serum and Hepatic Cholesterol Lowering effect, Cytoprotective and Anti-Ulcer activity, Antimicrobial and Antifungal activities as well. The present review will help the future researcher to understand and gather the information that this is used in traditional medicine since a long duration of time especially USM and other systems. It is expected that the molecular mechanism behind the action of these phytochemicals lead to discovery of new drugs for the treatment of many diseases.

## References

1. The Unani Pharmacopoeia of India. Part I Vol.1. New Delhi: GOI Ministry of Health and Family Welfare, Dept. of AYUSH, 2007, 88-89.
2. Kirtikar KR, Basu BD. Indian Medicinal Plants, Vol. 10, 2nd Ed Oriental Enterprises, Uttaranchal, India, 2003, 3363-3367.
3. Baitar AAI. Al Jami ul Mufradat al AdviawalAghzia, Vol. 1, Central Council for Research in Unani Medicine, New Delhi, 2000, 349-352.
4. Khare CP. Encyclopedia of Indian Medicinal plants. Germany: Verlag Berlin Heidelberg, 2004, 354-356.
5. Jerald EE and Jerald SE, Color Atlas of Medicinal plants, common names and classifications; Satish Kumar Jain for CBS Publications and Distributors, Darya Ganj New Delhi, 2006, 263.
6. Nadkarni KM. Indian Materia Medica, popular prakashan, Mumbai, 2005:1:1308-1315.
7. Kirtikar KR and Basu BD. Indian Medicinal Plants, Vol-10, Editon II, Oriental enterprises, Uttranchal, 2012, 3363-3485.
8. Anonymous. Quality Standards of Indian Medicinal plants, vol-8, Indian Council of Medicinal Research, New Delhi, 2010, 347-356.
9. Anonymous. Medicinal Plants of Andhra Pradesh part 1, Central Council for Research in Unani Medicine, Ministry of AYUSH, Govt. of India, New Delhi, 2009, 251-252.
10. Kokate CK, Purohit AP, Gokhale SB, Pharmacognosy, Nirali Parkashan, J M Road, Pune, 53rd Ed, 2017, 14.129-14.131:15.64,
11. Kabeeruddin M. Makhzanal Mufradat. New Delhi: Ejaz Publishing House; YNM, 366-367.
12. Ghani N. Khazain ul Advia, 1st Ed, Idara Kitab ul Shifa, New Delhi, (YNM), 211-212.
13. Rafiquddin M. KanzulAdviaMufarrada. Aligarh: Muslim University Press, 1985, 76-78.
14. Mohammad AH. Bustan ul Mufradat, (Reprint) Idarae Kitab-us Shifa, New Delhi YNM: p.60.
15. Evans WC. Trease and Evans pharmacognosy, 15th Ed, Elsevier, 2008, 52.
16. Jian Ping MA, Xiao Ling JIN, Yang Li, Zhong Li LIU. Two New Diarylheptanoids from the Rhizomes of *Zingiber officinale*, Chinese Chemical Letters, 2004:15(11):1306-1308.
17. Motawi TK. Hamed MA, Shabana MH, Hashem RM, Naser AFA. *Zingiber officinale* acts as a nutraceutical agent against liver fibrosis, Nutrition & Metabolism, 8, 2011: p.40.
18. Raji Y, Udoh U S, Oluwadara O, Akinsomisoye O S, Awobajo O, AdeshogaK. Anti-inflammatory and Analgesic properties of the rhizome extract of *Zingiber officinale*, Afr J Biomed. Res, 2002:5:121-124.
19. Khaki A, Fathiazad F, Nouri M, Khaki AA, Ozanci CC, NovinMG, et al. The effects of Ginger on spermatogenesis and sperm parameters of rat, Iranian Journal of Reproductive Medicine, winter, 2009:7(1):7-12.
20. Nalbantsoy A, Tamiş DA, Akgün H, Yalçın TO, Gürhan ID, Karaboz I. Antimicrobial and Cytotoxic Activities of *Zingiber officinale* Extracts, FABAD J. Pharm. Sci, 2008:33:77-86.
21. Vishwakarma SL, Pal SC, Kasture VS, Kasture SB. Anxiolytic and Antiemetic activity of *Zingiber officinale*, Phytotherapy Research, 16(7), 2002: p.621-626.
22. Alyahya MA, Rafatullah S, Mossa JS, Aqeel AM, Parmar NS, Tariq M. Gastroprotective activity of ginger (*Zingiber officinale* Rosc), in Albino rats. American Journal of Chinese medicine, 1989:17(1-2):51-56.
23. Siddaraju MN, Dharmesh SM. Inhibition of gastric H<sup>+</sup>, K<sup>+</sup>- ATPase and Helicobacter pylori growth by phenolic antioxidants of *Zingiber officinale*. Molecular Nutrition & Food Research. 2007; 51(3): p.324-32.
24. Auta KI, Galadium AA, Bassey JU, Olowoniyi OD, Moses OO and Yako AB. Antimicrobial properties of the ethanolic extracts of *Zingiber Officinale* (Ginger) on Escherichia coli and Pseudomonas aeruginosa. Annals of Biological Research, 2011:2(3):307-311.
25. Aghazadeh M, Bialvaei AZ, Aghazadeh M, Kabiri F, Saliyani N, Yousefi M, Eslami H, Kafil HS. Survey of the Antibiofilm and Antimicrobial Effects of *Zingiber officinale* (in vitro Study). Jundishapur journal of microbiology, 2016:9(2):30169:1-5.