



ISSN 2456-3110

Vol 8 · Issue 9

September 2023

Journal of
**Ayurveda and Integrated
Medical Sciences**

www.jaims.in

JAIMS

An International Journal for Researches in Ayurveda and Allied Sciences



Maharshi Charaka
Ayurveda

Indexed

Therapeutic potential of *Zingiber roseum* Roxb.

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ABSTRACT

Zingiber roseum Roxb, commonly known as the pink porcelain lily or pink ginger, is a plant species celebrated for its ornamental beauty and intriguing medicinal properties. Traditionally, the plant is being used by traditional healers for the treatment of disorders of gastrointestinal tract in Kheri district of Uttar Pradesh. This plant has been reported to be used in traditional healing system in other parts of the world especially Southeast Asia. Its appropriation with any of the classical drug has not been done till date. Plant has been reported to contain a wide variety of phytochemicals which make it a potential plant drug to be used for therapeutic purposes. In pharmacological screening studies, biological activities like Antioxidant, Antimicrobial, Immunomodulatory, Anticancer, Antiviral, Antifungal, Anti-inflammatory and many more have been demonstrated in different plant parts and fractions. Plant is considered to be native to Southeast Asia. It has been designated as endangered in IUCN plant list and needs attention. Present paper is an attempt to review different aspects pertaining to *Z. roseum* including botanical characteristics, phytochemical composition, and diverse therapeutic applications of *Zingiber roseum*.

Key words: *Zingiber roseum*, Zingiberaceae, Endangered, Phenol Compounds, Therapeutic uses.

INTRODUCTION

India is one of the bio-diversity hotspots. A large number of plant species are found growing ranging from heights of alpine region to deep sea, from Thar Desert to Marshy area of Sundarbans. This diversified vegetation has provided an opportunity of interaction of locally inhabited ethnic communities with surrounding flora and fauna. Number of medicinal plants used for therapeutic purposes as ethnomedicine in local health traditions is many times larger as

compared to Ayurveda. Plants are being widely used across India for sustenance of Health in Local Health Traditions. Medicinal plants can be defined as the plants that possess therapeutic properties or exert beneficial effect on the human or animal body.

Family Zingiberaceae, also known as 'ginger family' is a family of flowering plants consisting of 50 genera including 1600 known species of aromatic perennial herb with tuberous creeping or horizontal rhizomes globally distributed throughout Africa, Asia and America.^[1] *Zingiber roseum* Roxb. Is an important medicinal plant of family Zingiberaceae, widely used as a traditional medicine by various ethnic groups. Due to its medicinal properties, it considered an important member of Ginger family. It is also known as Rosy ginger or Pink porcelain lily^[2] or *Jungali Adrak* as per literary review. *Zingiber roseum* is a native of Southeast Asia, it is rarely domesticated plant though geographically distributed worldwide including Himalayan region and Eastern ghats.^[3]

India has a great variety of Ethno-medicinally important plant species due to its geographical

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Submission Date: 15/07/2023 Accepted Date: 27/08/2023

Access this article online

Quick Response Code



Website: www.jaims.in

DOI: [10.21760/jaims.8.9.18](https://doi.org/10.21760/jaims.8.9.18)

diversity and seasonal variation. Even though it is a richest reservoir of biological diversity, there are a vast variety of medicinal plants which are at risk of extinction. *Zingiber roseum* has also been categorised as an endangered medicinal herb by recent researches and survey studies.^[3] Due to presence of several bioactive essential oils and aromatic properties, its rhizome is used in 'Siddha System' of medicine for medication and therapeutic management.^[4] It possesses lots of biologically active compounds and phytochemicals. Rhizome of plant is used by traditional healers of Himalayan region and Southern India for treating skin diseases, liver infection, cough and cold, fever and digestive disorders. They use it as a wound healer in piles, throat swelling and cardiac diseases.^[5,6]

Plant Description

It is a 1-1.5 m tall perennial herb, having a thick and dense rhizome which is light pink or white externally & light yellowish on the inside. Several fleshy tuberous roots present, covered with a long sheath in lower section. Leafy stalk present. Leaves are in length of 25-30cm & shape of oblong-lanceolate, acuminate tip & rounded base having pubescent which is green above & reddish brown beneath. Short & sessile petiole pubescent, covered with red dotted pulvinus. bilobed 1.5-2cm ligule with nearly rounded membranous apex. Inflorescence is radical in shape, procumbent, originates from the concealed rhizome. Peduncle is very short or non-existent. Ellipsoid is 3-5 cm long pinkish red in colour. 4-5 cm pale red bracts, outer part is broadly ovate while internally obovate-oblongate in shape. Bracteoles are 3-3.2cm long, 0.9-1cm wide shorter than bracts with white membranous, & linear lanceolate in shape. Tubular membranous Calyx with a little toothed tip. Corolla is pale red & subequal segmented about 5cm long with 2.5cm curved dorsal lobe and 1cm linear lateral lobe. Yellowish white, 3 lobed Labellum, smaller than the corolla's lobe, shape is oblong cuneate with a recurved crisp & white edge. Stamines are tiny spherical & golden in colour, laterally present. Ciliate stigma with long & filiform style. Anthers are sessile with 1cm long thecae, crest narrow long curved, & dark yellow. Ovary is 6-7mm long, 3-4mm in diameter, pubescent & oblongoid.

Ovoid-elliptic red capsule with 3.4-3.6cm long & 2.4-2.6cm in diameter. Seeds of plant may grow up to 7mm in length. Flowers white in colour. Flowering and fruiting April to August^[7,8,9]



Zingiber roseum in natural habitat: Dudhwa Tiger Reserve



Inflorescence

Distribution

Zingiber roseum is globally distributed in India, Myanmar, China & Thailand.^[8] In India, it is found in Uttar Pradesh, Uttarakhand (Dehradun, Pithoragarh, Pauri), Bihar, West-Bengal, Orissa, Kerala, Andhra

Pradesh, Manipur (Imphal),^[7] Maharashtra (Jalgaon).^[10] In Uttar Pradesh it is found growing in Dudhwa Tiger Reserve and Pilibhit Tiger Reserve.

Plant Taxonomy^[11]

Kingdom	Plantae
Phylum	Tracheophyta
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	Zingiber
Species	roseum
Binominal name	<i>Zingiber roseum</i> Roxb.

Synonyms - *Amomum roseum* Roxb^[13]

Vernacular Names - Rosy ginger, *Jungali adrak*, Pink porcelain lily

Local names by tribes - Tamil - *Inji*,^[12] Telugu - *Rajula gadda*,^[6] Malayalam - *Malayinchil*^[13]

Although this plant is not mentioned in any classical text of Ayurveda and API, yet some work has been done on detection of its 'Ras Panchak' and action on *Dosh Dhatu* and *Mal* have been reported.^[14]

Rasa	<i>Katu, Tikta</i>
Guna	<i>Laghu, Ruksha</i>
Virya	<i>Ushna</i>
Vipak	<i>Katu</i>
Dosh Karma	<i>Kapha-Vata Shamak</i>
Dhatu Karma	<i>Rasayana</i>
Mal Karma	<i>Anulomana</i>
Vishishta Karma	<i>Kushthaghna, Vranaropana, Aamhara, Deepana, Pachana, Jantughna, Yakrita-Dosahara</i>

Ethnomedicinal Uses

1. It is used by local healers of Himalayan region and Eastern ghat of India to treat fever, cough, cold, gastric ulcer infection, skin diseases, Rheumatic arthritis, indigestion and liver infections.^[15,5]
2. Tribes of South India use it to treat stomach ache, swelling throat, fever, cough-cold, piles, heartburn, cardiac disease.^[6]
3. Its rhizome used by Chinese people customarily to treat lots of abdominal disorders like nausea, vomiting and motion sickness.^[8]
4. Tribes of Andhra Pradesh use its rhizome to treat various skin diseases by local application of its fine paste.^[16]
5. People of Vellore district of Tamil Nadu, India takes it internally by making a juice of rhizome with honey, it helps to relieve giddiness and cure indigestion.^[12]
6. The tuberous roots is roasted in fire, paste is given along with food in pain and Renal calculi.^[17]
7. Along with *Crotalaria pectabilis* Roth. Leaves & *Abrus precatorious* seeds rhizome of *Z. roseum* (Roxb) Rosc. is cooked in mustard oil this oil is used for massage in joint pain and inflammation.^[17]
8. Due to aesthetic look and attractive inflorescence *Zingiber roseum* also cherished for its ornamental properties in addition to its medicinal attributes. Its attractive pink flowers used for ornamentation & floral arts. This beautiful plant produces a soothing fragrance due to which use in Siddha medicine for medication.^[8]

Phytochemical Constituent^[8,18]

Researches have reported the presence of several biologically and pharmacologically active phytochemicals in *Zingiber roseum*. The plant contains a high content of terpenes, terpenoids, gingerol and essential oils isolated from aqueous and hydrophobic extracts of different parts of the plant like rhizome, seed, flower, and fruit having pharmaceuticals properties. Due to all these characteristics, plant possesses an important medicinal value in modern

medicine.^[8,18] After reviewing number of articles, it is clear that major components of *Zingiber roseum* are Zerumbone, linalool, limonene, α -pinene, α -terpineol, 1,8-cineole, camphene, terpinolene, β -caryophyllene, γ -cadinene, deoxynivalenol, naphazoline, estazolam, myricetin, epicatechin, myricetin and propofol. Major phytoconstituents present in *Zingiber roseum* are being listed below.^[8]

SN	Phytochemical	Biological Activities Reported
1.	Linalool	Antioxidant, anti-inflammatory, antibacterial, antinociceptive, anticonvulsant
2.	Limonene	Antioxidant, antimicrobial, immunomodulatory, anticancer, antiviral, antifungal, anti-inflammatory
3.	α -pinene	Antinociceptive, anti-inflammatory, antidiarrheal,
4.	β -pinene	Antiviral, antidepressant, phytotoxic
5.	α -terpineol	Anticonvulsant, antibacterial, anticancer, antidiarrheal
6.	1,8-cineole	Antimicrobial anti-inflammatory, antinociceptive, antitumor
7.	camphene	Antiviral, anti-hyperlipidaemic, insecticidal
8.	terpineol	Wound healing, sedative, antifungal
9.	β -caryophyllene	Anticancer, antimicrobial, analgesic
10.	γ -cadinene	Antifungal, antioxidant
11.	Zerumbone	Anticancer, antinociceptive, antimicrobial, anti-inflammatory, antisecretory, antidiabetic
12.	Deoxynivalenol	Haemolytic, antimicrobial, anticancer
13.	n-heptane	No activity reported
14.	Ethyl-propionate	Antibacterial, anticancer
15.	Ethyl-heptanoate	Flavour industry

16.	Naphazoline	Myopathic ptosis, radioprotection
17.	Estazolam	Anxiolytic, sedative, anticonvulsant
18.	iso-propyl benzene	Antidiabetic, anticancer
19.	propofol	Anaesthesia, antioxidant
20.	Methyl-cyclopentane	Antioxidant.
21.	Catechin hydrate	Antioxidant, amelioration of cognitive impairment & neurodegeneration
22.	Epicatechin	Antioxidant, antimutagenic
23.	Rosemarinic acid	Antioxidant, antiviral
24.	Trans ferulic acid	Antioxidant, antiviral
25.	Quercetin	Antitumor, hepatoprotective, antibacterial
26.	Myricetin	Antifungal.
27.	Widdrol	Phytotoxic, antifungal
28.	Humulene epoxide	Antifungal.
29.	10epi-gamma-eudesmol	Anti-microbial anti-inflammatory
30.	Stigmasterol	Antifungal, antidiabetic, antitumor

Percentage of Phytochemicals^[8,19]

SN	Phytochemicals	Plant parts			
		Rhizome	Seed	Flower	Fruit
1.	Limonene	14%	2.2%	5.2%	2.2%
2.	Linalool	53.3%	-	-	-
3.	β - pinene	9.3%	53.5%	55.9%	58.3
4.	α - pinene	4.4%	13.9%	14.1%	9.7%
5.	p-cymene	-	4.1%	-	-

6.	α -terpineol	-	4.7%	-	4.6%
7.	verticiale	-	1.4%	-	-
8.	Terpinene-4-ol	-	-	-	5.3%

Altitudinal variability also reported in active components of plant. They vary with altitude and geography as the environment factors have direct and indirect influences, which affects the effectiveness of various biological activity of plant due to development of phytochemicals in plant.^[18]

Biological Activities

Zingiber roseum contains numerous pharmacological & biologically active compounds which shows lots of pharmacological activity as per different scientific researches. Phytochemicals identified from *Zingiber roseum* shows effective multitherapeutic activities like antitumor, antimicrobial, anti-inflammatory & HIV inhibitory activities.^[20,21,22,23] Phenolic compounds obtained from different parts of the plant on demonstration with different extract shows a vast variety of pharmacological actions which are documented scientifically such as anti-arthritis, immunomodulatory, antipyretic, anti-inflammatory, analgesic, hepatoprotective, vasodilatory & anti-thrombotic activities^[24-27] Studies revealed that phenol has strong antioxidant potentials so due to presence of phenolic compound *Zingiber roseum* also shows antioxidant activity.^[28,29,30] Essential oils derived from *Zingiber roseum* reported several medicinal uses due to presence of biologically active compounds.^[31] Some preliminary pharmacological studies on plant revealed the presence of important phytoconstituents which shows pharmacological and medicinal properties of *Zingiber roseum*. Some of them are described below.

Hepatoprotective Activity

Study shows that there is presence of seven phenolic compounds in rhizome extract of *Z. roseum*. These are Quercetin, Myricetin, Catechin hydrate, Trans-ferulic acid, Trans-cinnamic acid, Epicatechin and Rosmarinic acid.^[8] Due to presence of these compounds, rhizome extract of plant at all doses significantly reduced elevated serum aminotransferase (AST), ALT and ALP.

It shows an antiproliferative effect in CCl₄ induced cell damage in mice, due to potent antioxidant activity^[29]

Antispasmodic Activity

Essential oils obtained from seed extract of *Z. roseum* have efficient antispasmodic activity in rat duodenum. The oil showed myorelaxant activity on isolated rat duodenal smooth muscle. A dose of 0.01-300 μ g/ml of ZRSEO (*Zingiber roseum* seed essential oil) was found to have antispasmodic action on KCl & carbachol induced contraction in the rat duodenum.^[32]

Antioxidant Activity

There is phytochemical diversity among different extracts of plant parts like seed, rhizome, perianth. They shows lots of potent phytochemicals like Ascorbic acid 2, 6-dihexadecanoate, 2-(4-hydroxy-3-methoxyphenyl)-3. They also possess some compounds like Vit E, terpenes, gallic acid, ferulic acid, camphene, α -terpineol. Due to presence of all these phytochemicals, extracts of plant part show potent antioxidant activity.^[4]

Antifungal and Antimicrobial Activity

The methanol extract of seed, rhizome, and perianth were analyzed and found that it has a significant contribution in antifungal activities, inhibiting the mycelial growth of the tested pathogenic fungus *F. accuminata*, based on their IC₅₀ values.^[8] Ethanol extract of Rhizome shows significant antimicrobial activity. It inhibits growth of bacteria on different organic solvents. Chloroform extract of rhizome is exhibiting a proved antimicrobial activity against four different bacterial strains staphylococcus aureus, streptococcus pyogenes, Escherichia coli and pseudomonas aeruginosa. The lowest minimum inhibitory concentration of crude extract of *Zingiber roseum* showed against staphylococcus aureus it was 20 μ g/ml concentration.^[33]

Herbicide Activity

Methanolic extract of rhizome & seed of *Zingiber roseum* has different efficiency to inhibit seed germination. Inhibitory activity of *Zingiber roseum* rhizome methanol extract was higher than *Zingiber*

roseum seed methanol extract.^[34] Molecules which have herbicidal activity are caryophyllene, bisabolene, terpineol, β -citronellal, neridol,^[35,36] α -pinene,^[37] also phenolic acids, terpenoids, & tannins found in extracts of *Zingiber roseum* expressed its significant herbicidal activity.^[8]

Antidiabetic Activity

Stigmasterol obtained from methanol extract of *Zingiber roseum* rhizome. It shows an antidiabetic activity in HFD-induced diabetic rat. Another study reveal that β -sitosterol also reduce the level of blood glucose when administered at 20 mg/kg in diabetes induced rats. It also altered levels of testosterone, insulin, and blood sugar as well as the insulin receptor & glucose transporter 4(GLUT4) proteins.^[8]

Anti-Inflammatory Activity

Researchers reported that Zerumbone, a major phytochemical of plant possesses a strong potential towards inflammation. It has been well explored for its capacity to reduce pain.^[8] It decreases inflammation in endotoxin treated mice during acute lung injury (ALI). At the doses of 5,10,50 and 100 mg/kg. of Zerumbone via i.p administration, there is significant suppression in carrageenan-induced paw edema in mice.^[38]

CONCLUSION

The present article is a concise review of *Zingiber roseum*. On the basis of scientific researches, the article provides a brief and informative description included morphological description, detected *Ras Panchak, Dosh Dhatu Mala* activity and a no of medicinally important phytochemicals. Study reveals its pharmacological activities like antimicrobial, antibacterial, antifungal, anti-cancerous, antidiabetic, herbicidal, anti-diarrheal due to presence of strongly active biological components, also it uses as an ethnomedicine since ancient era by traditional healers. All points conclude that *Zingiber roseum* is an important potent medicinal herb, yet least explored so there is a need to do more researches & clinical trial to high lighten its therapeutic potentials to help mankind.

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How to cite this article: Ansari Rosi, Mishra H.S, Agrawal Ajay Kumar. Therapeutic potential of Zingiber roseum Roxb. J Ayurveda Integr Med Sci 2023;09:112-119. <http://dx.doi.org/10.21760/jaims.8.9.18>

Source of Support: Nil, **Conflict of Interest:** None declared.
