

**A PERSPECTIVE REVIEW ON PHYTOCHEMICALS AND PHARMACOLOGICAL  
SIGNIFICANCE OF ZINGIBER OFFICINALE ROSCOE****Pathan Mujahed Khan Nasir Khan<sup>1</sup>, Priyanka Padhi<sup>2</sup>, Keshamma E<sup>3</sup>, Jagrati Meena<sup>4</sup>, Walkime R. Marak<sup>5</sup>,  
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India.**ABSTRACT**

Zingiber officinale represents one of the most extensively used plants and culinary flavorings. The Zingiberaceae family, which has over 1200 species in 53 genera, contains *Z. officinale*. *Z. officinale* is used to treat a wide range of illnesses and is recognized in traditional medicine for its many therapeutic qualities. Over the past several decades, *Z. officinale* has been the subject of intense scientific research for its potential medical benefits. A number of bioactive chemicals have been extracted from the plant and subjected to pharmacological analysis. This plant is a rich source of pharmaceutical compounds due to its medical characteristics. This study compiles data on the phytoconstituents and many pharmacological applications of *Z. officinale*.

**KEY-WORDS:** Phytochemicals, Anti-coagulant, Analgesic, Hepatoprotective, flavonoids.**INTRODUCTION**

In traditional medicine, plants and herbs have long been used as a source of curative chemicals. In both conventional healthcare systems and the global herbal and pharmaceutical industries, medicinal plants are significant players. These plants' therapeutic efficacy comes from a few chemical constituents that have a clear physiological effect on the human body. Among these plant bioactive components, alkaloids, tannins, flavonoids, and phenolic compounds are the most significant.<sup>[1,2]</sup>

*Z. officinale* is a significant tropical medicinal plant that is esteemed for its therapeutic qualities and as a spice all over the world. Ginger is a member of the family Zingiberaceae, which includes over 1300 species in 50 genera and is one of the four families that make up the order Zingiberales, which is a member of the monocotyledons class. Rhizomes are the only means of plant reproduction since it is sterile (does not generate seeds).<sup>[3-4]</sup>

*Z. officinale* has long been used to treat a wide range of illnesses, including nausea, vomiting, asthma, coughing,

palpitations, inflammation, dyspepsia, lack of appetite, constipation, indigestion, and pain, in Ayurvedic, Siddha, Chinese, Arabian, African, and Caribbean medical systems.<sup>[5]</sup> Over the past several decades, *Z. officinale* has been the subject of intense scientific research for its potential medical benefits. Various bioactive chemicals have been extracted from the plant's various sections and subjected to pharmacological analysis. Numerous health benefits of the plant have been shown, including antibacterial, anticancer, antioxidant, antidiabetic, nephroprotective, hepatoprotective, larvicidal, analgesic, anti-inflammatory, and immunomodulatory properties.<sup>[6,14]</sup>

**PLANT PROFILE****Taxonomy**

Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	<i>Zingiber</i>
Species	<i>Zingiber officinale</i>

## Synonyms[15]

Ginger	English
Adarakha	Hindi
Katubhadra	Sanskrit
Gember	Dutch
Gemeiner ingber	German
Gengibre/jengibre	Spanish
Gingembre	French
Jahe	Indonesian
Saenggang	Korean
Shokyo	Japanese
Aduwa, sutho	Nepali
Sheng jiang	Chinese
Ada	Bengali
Adu	Gujarati
Alla, Hasishunti	Kannada
Inchi	Malayalam
Ardrak, Ale	Marathi
Adi, Adrak	Punjabi
Allamu, Allam	Telugu
Adrak	Urdu

**Macroscopic characters**

This plant is perennial and may grow up to 60 cm of leafy stems. The rhizome is white, yellowish to brown,

fleshy fragrant, and branching horizontally. Narrow or linear-lanceolate leaves are present. There is a thick spike of flowers produced.<sup>[16]</sup>



**Fig. 1: Rhizomes of ginger.**

**Geographical source**

It's possible that *Zingiber officinale* is native to India. South and Southeast Asia, tropical Africa (particularly Sierra Leone and Nigeria), Latin America, the Caribbean (particularly Jamaica), and Australia are among the regions where it is extensively cultivated for commercial use.<sup>[17]</sup> The world's largest producer of *Z. officinale* is India. It is grown in practically every state in India. According to several studies, the climates of Kerala, West Bengal, Orissa, and the northeastern parts of India are more suited for *Z. officinale* development.<sup>[18]</sup>

**PHYTOCHEMICALS**

A wide range of compounds have been extracted from *Z. officinale* and thoroughly investigated for their chemical

structure by the application of sophisticated analytical methods including high performance liquid chromatography (HPLC) and gas chromatography-mass spectrometry (GC-MS). The fresh and dried *Z. officinale* extracts have been reported to possess<sup>[6]</sup> gingerols,<sup>[8]</sup> gingerols,<sup>[10]</sup> gingerols, 1,7-bis-(40-Hydroxy-30-methoxyphenyl)-3,5-heptadione, adenine, 1-Dehydro-3-dihydro-<sup>[10]</sup>gingerdione, Acetoxy-6-dihydroparadol,<sup>[4]</sup> Isogingerol, 5-Methoxy-<sup>[6]</sup>gingerol, Methyl diacetoxy-<sup>[4]</sup>gingerdiol, Methyl diacetoxy-<sup>[10]</sup>gingerdiol, 1-Dehydro-<sup>[3]</sup>gingerdione, Acetoxy-<sup>[4]</sup>gingerol,<sup>[4]</sup> Shogaol,<sup>[6]</sup> Shogaol,<sup>[8]</sup> Shogaol,<sup>[10]</sup> Shogaol,<sup>[12]</sup> Shogaol,<sup>[6]</sup> Paradol,<sup>[7]</sup> Paradol,<sup>[8]</sup> Paradol,<sup>[9]</sup> Paradol,<sup>[10]</sup> Paradol,<sup>[11]</sup> Paradol,<sup>[13]</sup> Paradol, 1-(40-Hydroxy-30-methoxyphenyl)-7-octen-3-one, 1-(40-Hydroxy-30-

methoxyphenyl)-7-decen-3-one, 1-(40-Hydroxy-30-methoxyphenyl)-7-dodecen-3-one, palmitate, isovanillin, glycol monopalmitate, hexacosanoic acid 2,3-dihydroxypropyl ester, maleimide-5-oxime, p-hydroxybenzaldehyde and 1-(omega-ferulyloxygeratyl) glycerols.<sup>[19-21]</sup>

## PHARMACOLOGICAL SIGNIFICANCE OF ZINGIBER OFFICINALE

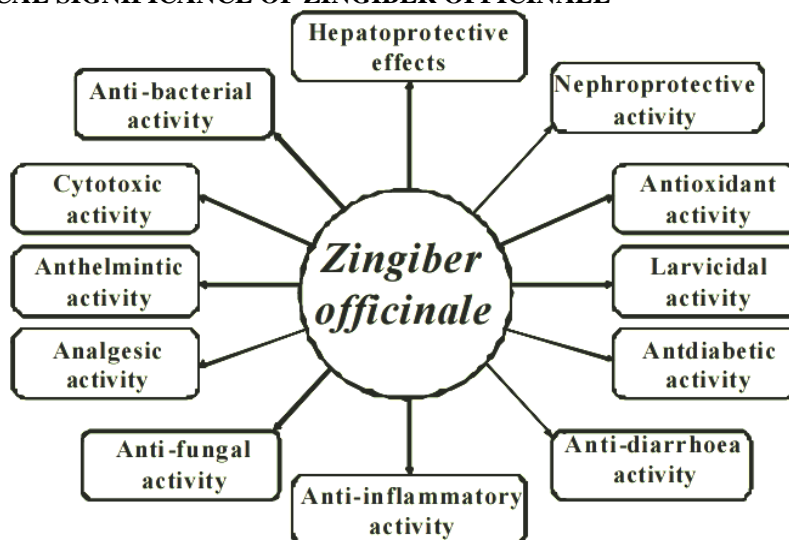


Fig. 2: Pharmacological activities of Ginger.

### 1. Gastrointestinal relief

Current scientific studies have shown that ginger offers a wide range of medicinal benefits, including as direct anti-inflammatory activities, antioxidant effects, and the capacity to prevent the synthesis of inflammatory chemicals. Ginger is an extremely useful symptom-prevention tool for motion sickness, particularly seasickness. All motion sickness symptoms, such as nausea, vomiting, dizziness, and cold sweats, are lessened by ginger.<sup>[22]</sup> Certain active ingredients in ginger have been shown to increase muscle activity in the digestive system, which in turn promotes digestion, absorption, relief from constipation, and gas.<sup>[23,24]</sup>

### 2. Anti-Inflammatory Effects

Gingerols are strong anti-inflammatory chemicals found in ginger. These compounds are thought to be the reason why so many individuals with rheumatoid arthritis or osteoarthritis report better mobility and less pain when taking ginger on a regular basis. One possible mechanism via which ginger produces its ameliorative effects is by inhibiting the formation of leukotrienes and prostaglandins.<sup>[25]</sup>

### 3. Anticoagulant effects

According to reports, ginger inhibits platelet aggregation,<sup>[26]</sup> and decreases the generation of platelet thromboxane in vitro. Antiplatelet effects are demonstrated by 8-gingerol, 8-shogaol, 8-paradol, and gingerol derivatives.<sup>[27]</sup> Nevertheless, research on ginger's benefits in vivo is still lacking. The reduction in platelet aggregation can be attributed to ginger.<sup>[28]</sup>

### 4. Effect on cardiovascular system

Ginger tightens the cardiovascular muscles and increases blood flow to all parts of the body. It is thought that the

increased blood flow increases the metabolic activity of cells, relieving tension and cramping. Additionally, it lowers cardiac strain and blood pressure.<sup>[29]</sup>

### 5. Antimicrobial activity of ginger

Due to its wide spectrum of antibacterial properties against gram positive and gram negative bacteria, fungus, and other microorganisms, ginger has long been used. Ginger can be used to treat flatulence because in vitro studies have demonstrated that its active ingredients prevent intestinal bacteria from growing and fermenting undigested carbohydrates.<sup>[30]</sup> Salmonella, Escherichia coli, Proteus sp., Staphylococci, and streptococci are all inhibited in their growth by it.<sup>[31]</sup>

### 6. Anti-cancer effects

Ginger has been reported to have chemopreventive effect against colon cancer and to be anti-carcinogenic via various routes.<sup>[32]</sup> Additionally, gingerol stopped human colorectal cancer cells from growing.<sup>[33]</sup>

### 7. Analgesic activity

The mice used in the hot-plate test and acetic acid-induced writhing were used to assess the analgesic effect of *Z. officinale* oil. According to the study, mice exposed to chemical and thermal pain stimuli experienced a considerable analgesic response.<sup>[34]</sup>

### 8. Antidiabetic Activity

In streptozotocin-induced diabetic rats, ginger was found to have hypoglycaemic action. When compared to the control group, treatment with ginger aqueous extract (500 mg/kg body weight, i.p.) for 7 weeks significantly lowered the levels of triacylglycerol, cholesterol, and blood glucose in the diabetic-induced rats.<sup>[35]</sup> When streptozotocin-induced type I diabetic rats were given

ginger juice, their fasting glucose levels dropped and their insulin levels significantly increased. In diabetic rats, ginger therapy also reduced blood pressure, serum triglycerides, and serum cholesterol.<sup>[36]</sup>

### 9. Antioxidant activity

Extracts from ginger roots include polyphenol chemicals with significant antioxidant activity (6-gingerol and its derivatives). Antioxidant substances are commonly employed to combat free radicals, which are responsible for oxidative stress within cells. Flavones, isoflavones, flavonoids, anthocyanin, coumarin, lignans, catechins, and isocatechins are responsible for their antioxidant activity.<sup>[37]</sup>

### 10. Immune Boosting Action

In addition to keeping you warm on chilly days, ginger encourages healthy sweating, which is beneficial when you have a cold or the flu. More benefits from a good sweat than only aiding in detoxifying are possible. It offers defense against invasive microorganisms, including as fungus like *Candida albicans* and bacteria like *E. coli* and *Staphylococcus aureus*, which is frequently the cause of skin infections. In immunosuppressed mice, ginger essential oil improved the humoral immune response.<sup>[38]</sup>

In addition, ginger is frequently used to treat a wide range of illnesses, including indigestion, dyspepsia, hunger loss, flatulence, intestinal, nausea, vomiting, allergic reactions, fever, common cold, cough, sinusitis, allergic rhinitis, acute chronic bronchitis, respiratory issues, pain, headache, backache, or any type of muscular catch, painful teeth, swollen gums, and viral infections.<sup>[39]</sup>

### CONCLUSION

Worldwide, medicinal plants have a significant economic impact. *Zingiber officinale* is a significant plant that is utilized in traditional medicine for its many therapeutic, ethnomedical, and nutritional properties. Worldwide, ginger is used as a spice and flavoring and is said to have several health benefits. Numerous chemicals in ginger are responsible for its various medical qualities, including its ability to protect the heart, reduce inflammation, fight bacteria, boost antioxidant levels, and fight cancer. Our review aims to provide scientific researchers with all the information they need to understand ginger as a significant medicinal plant. Further research and development should go into the creation of pharmaceutical products so that people can benefit from their improved economic and therapeutic uses.

### CONFLICT OF INTEREST

The authors declare that the review was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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