Chapter 30

Medicinal Benefits of Zingerbreaece Family, Ginger Root and Turmeric

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ABSTRACT

Turmeric and Ginger's roots are associated with the Zingerbreaece family. Turmeric has carminative, stimulating, and fragrant properties, making it a moderate digestive. Curcumin is the active component of turmeric. Turmeric (*Curcuma longa*) has been broadly studied for its various pharmacological properties, as well as its potential role as an anticancer agent, antioxidant, and radio protector. Turmeric is believed to possess numerous medicinal benefits, such as enhancing the body's overall energy, reducing gas, eliminating worms, enhancing digestion, controlling menstruation, breaking down gallstones, and alleviating arthritis. Most drugs used in conventional and contemporary medical systems worldwide are derived from plants. On the other hand, changes made to the molecular structures of these medications are reducing their toxicity and side effects while increasing their biological function, selectivity, and ability for metabolism, absorption, distribution, and excretion. When curcumin is used medicinally, it treats a wide range of diseases, including hysteria, diabetes, indigestion, vomiting, smallpox chicken pox, asthma, cough, fever, anemia, eye disease, and hysteria. Curcumin, which a compound called bis desmethoxycurcumin, triethyl Curcumin, tetrahydro Curcumin, circumoral, circumoral, zingiberene, eugenol, turmeric, turmerones, and turmerones are only a few of the many phytoconstituents found in turmeric. Curcumin, the compound that provides curcumin its yellow color and much of its medicinal properties, is the most active of them. Ginger is also said to be a potent aphrodisiac. Wear and tear of the cell. Rich in vitamins and minerals, ginger also includes essential oil, starch, and oleoresin, which is made up of chemicals called gingerol and shegrohaol that have anti-inflammatory and antiemetic properties and quicken intestinal transit.

KEYWORDS
Medicinal, benefits, *Zingerbreaece* family, Ginger root, Turmeric, Curcumin, Gingerol, Shegrohaol, Diseases

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INTRODUCTION

Zingiber officinale roscoe commonly known as ginger, it is a popular spice that has exhibited a variety of pharmacological activity, as well as antioxidant, anticancer, and anti-inflammatory effects. Gingers are valuable natural resources that may be useful to make a wide range of items as well as food, spices, medications, colors, perfume, and more. The *Zingiberaceae* family is widely dispersed in tropical climates, especially in Southeast Asia, and is well renowned for its medicinal properties (Mao, 2019). Rhizomatous herbs, either annual or perennial, make up the Zingiberaceae family. The color of the rhizomes varies depending on the species; they can be any of these colors pink, mild yellow, deep yellow, greenish blue, or a combination of them. In terms of structure, form, size, texture, and venation, the leaves differ morphologically. They are also distichous (Karpuz Ağören, 2024).

Ginger root (ground) contains the following minerals: manganese (33.3 mg/100 g), magnesium (114 mg/100 g), iron (19.8 mg/100 g), potash (1320 mg/100 g), sodium (27 mg/100 g), phosphorus (168 mg/100 g), and zinc (3.64 mg/100 g). Raw ginger root contains the following minerals: 16 mg/100 g of calcium, 0.6 mg/100 g of iron, 43 mg/100 g of magnesium, 34 mg/100 g of phosphorus, 415 mg/100 g of potassium, 13 mg/100 g of sodium, and 0.34 mg/100 g of zinc, corresponding to the USA (2013). Ginger was found to have trace minerals, coloring matter, essential oil (1.5–3%), fixed oil (2–12%), and 40–70% starch as well, 6-20% proteins, 3-8% fiber, 8% ash, 9–12% water, and other fragrant ingredients (Shahrajabian et al., 2019a).

Inflammation is the immune system's response to an injury or illness. These are the five classic indicators of inflammation: heat, redness, swelling, discomfort, and loss of function, which were identified by the ancients based on visual observation. Long-term inflammation can have detrimental effects on health, such as cancer. Therefore, redness

must be neutralized. Herbs and spices are examples of medicinal plants that are essential in treating pathologies linked to inflammatory responses. Due to their anti-inflammatory properties, spices have long been used as an effective treatment for inflammatory illnesses like fevers, migraines, and arthritis. Since inflammation is thought to be the cause of many diseases in the modern world, spices like ginger (*Zingiber officinale*) and turmeric (*Curcuma longa*) can help treat inflammatory conditions (Azeez et al., 2021).

The tuberculous or non-tuberous rhizomes of the *Zingiberaceae* family of plants are highly aromatic and therapeutic. It is widely acknowledged as ginger and is primarily found in South and Southeast Asia. It is found worldwide in roughly 50 taxa and 1,300 species. In several Asian nations, powdered ginger from *Zingiberaceae* plants is used as a food additive. Medicinal uses in the treatment of illnesses like Traditional treatments also often mention rheumatism, diarrhea, coryza, and dermatosis problems. Numerous essential oils, such as terpenes, alcohols, ketones, flavonoids, carotenoids, and phytoestrogens, are found in Zingiberaceae plants. For example, 6-gingerol is present in Zingiber officinale water extract and is mostly found in the rhizome at 130–7,138 parts per million. Curcumin, the primary functional component of Curcuma turmeric, can be found in certain species at quantities of up to 38,000 parts per million (Chen et al., 2008).

The Zingiberaceae family includes approximately 1300 types of aromatics, flowering perennial herbs with properties with sneaking horizontally or tuberous rhizomes. The Americas, Africa, and Asia are the three continents where they are most widely dispersed. The most well-known members of this family are the following: galangal, often known as Thai ginger (*Alpinia galanga (L.) Willd.*), Javanese ginger (*Curcuma zanthorrhiza* Roxb.), turmeric (*Curcuma longa L.*), ginger (*Zingiber officinale Roscoe*), and turmeric. This family has a diverse range of bioactive chemicals identified, isolated, and studied (Table 1). Given the belief that "you are what you eat," researchers have worked hard to identify naturally occurring sources of antioxidants in food. The main function of these exogenic antioxidants is to eliminate excess free radicals in addition to enhancing the body's natural antioxidant defense system. Notable products considered good sources of exogenous antioxidants include green, other spices, and herbs. Usually phenolic or thiolic chemicals, the Zingiberaceae family is a major source of these dietary antioxidants (also recognized as the ginger family (Alolgla et al., 2022).

Table 1: The medicinal value of ginger root and turmeric.

Parameter Name	Tumeric	Ginger Root	References of Tumeric	References of Ginger root
Scientific Name	(*Curcuma Longa* Linn.) *Curcuma Aromatica*	(*Zingiber Officinale*. Linn)	(Meena et al., 2015)	(Saribaeva et al.,2024)
Origin	India	Southeast Asia	(Kaur, 2019)	(Pázmándi et al.,2024)
Daily Dose	500g per day of dry root	170mg to 1 g 3 to 4 time of fresh root	(Eke-Okoro et al., 2018)	(Apalowo et al.,2024)
Treat Diseases	Boost Immunity, improve liver, and help to Maintain Diabetes	Vomiting from motion, Sickness, Pregnancy, Cancer and Chemotherapy	(Hayet al., 2019)	(Sharma et al.,2024)
Principle Compound	Curcumin(diferuloylmethane) causes the yellow color in Tumeric and Desmethoxycurcumin	Gingerols, long time heating, and storage convert into Shogaols, Paradol	(Sony et al., 2014)	(Xiong et al.,2024)
Vitamins	vitamin C, vitamin B6,	Vitamin C Carbohydrate (50-70) %, Lipid (3-8) %	(Yestemirova et al., 2024)	(Matin et al., 2024)

Antibacterial Activities in Ginger

Spices are used for more than just flavoring food; they are also commonly prescribed in traditional medicine, employed as food maintenance and antifreeze, and extend food life span to avoid food deterioration and food-borne illnesses (Zaman et al.,2017). Antibiotics, which were incredibly successful in treating bacterial transmittable at the start of the 20th century, are now losing some of their effectiveness because bacterial cells have been gradually developing resistance to common antibiotics for decades, and the human host is unaware that this is happening. Consequently, medicinal plants may be a new and intriguing substitute for these inactive antibiotics. By examining the available published research, this minute review seeks to determine the effectiveness of ginger root Salk (*Zingiber officinale Rosc*.) as an antibacterial factor (Abdalla and Abdallah 2018).

The ginger possesses direct anti-microbial activity, making it a useful tool for treating bacterial illnesses. In Chinese Traditional Medicine, it is utilized as a stimulant and in conjunction with collagen to treat dyspepsia (Tan and Vanitha, 2004). As a Yang herb, ginger is said to lower Yin and sustain the body. Ginger is described as spicy and fiery in traditional Chinese medicine, and it is said to heat the body and medicate cold extremities, refine pale and sluggish pulses, direction pale complexions, and vigor the body after blood loss. Herbal therapy is used in traditional Chinese medicine to manage a variety of cardiovascular conditions (Shahrajabian et al., 2019b).

Research has revealed that, as a result, new antibiotics must be developed to treat these illnesses and infections caused by Propionibacterium. This discovery has made it necessary to look for novel plant-based medicinal compounds with antibacterial properties that can combat harmful microbes. Research has only been done on garlic, ginger, cinnamon,

and turmeric, according to (Aqeel et al., 2024). So, the antibacterial activity of turmeric (*Curcuma louga*) and ginger (*Zingiber officinale roscoe*) against Propionibacterium spp. proves crucial to treating the diseases that are caused by bacteria (Flores et al., 2021).

Antibacterial Activities in Turmeric

Turmeric is a mild digestive due to its stimulating, carminative, and aromatic qualities. Turmeric is one of the universe's energetic remedies. Turmeric's biologically active is called Curcumin. Turmeric has been consumed more than 2500 times in India, in which it was probably first utilized as a color. The medicative healthful properties of these condiments have progressively become apparent over time. More recent research has revealed that turmeric is an amazing ingredient that can assist in treating extensive conditions, including cancers and Alzheimer's disease, even though it has long been renowned for its anti-inflammatory properties. An antibiotic ointment made with the spice is used in India. (Debjit Bhowmik et al., 2009).

It has been proved experimentally that Curcumin works effectively against Staphylococcus aureus (infections that cause pus) diseases including anemia, cancer, diabetes, staph infections, wounds, gallstones, indigestion, IBS, parasites, and poor circulation. Since turmeric reduces Kapha, it is used to treat watery discharges such as leucorrhea, pus in the eyes, ears, or wounds, and throat mucus. Turmeric is a mild digestive due to its stimulating, carminative, and aromatic qualities. Turmeric is one of the universe's most powerful remedies. Turmeric's active ingredient is called curcumin. Turmeric has been consumed for more than 2500 years in India, in which it was probably first utilized as a color. The medicinal properties of this spice have progressively become apparent over time. More recent research has revealed that turmeric is an amazing ingredient that can assist in treating a wide range of conditions, including cancers and Alzheimer's disease, even though it has long been renowned for its anti-inflammatory properties. An antibiotic ointment made with the spice is used in India (Bhowmik et al., 2009).

Polyphenolics Content in Ginger Root

The maximum concentration of total polyphenols (840 and 830 mg/g) was found in the aqueous separate at nearly identical levels at different temperatures. In acetonic, there were the fewest polyphenols excerpts. Plant extracts' antioxidant properties were typically associated with their phenolic content. The hampering of the lipid's capacity to scavenge free radicals and produce oxygen species, including singlet oxygen, superoxide free radicals, and hydroxyl radicals, is due to the hydrogen-donating properties of phenolic compounds (Hinneburg et al., 2006).

It is widely acknowledged that non-phenolic antioxidants may also play a role in the plant extract's antioxidant activity. Researchers calculated the total polyphenol content in an 80% methanolic evoke of 35 distinct herbs and medicinal herbs. According to Keservani et al. (2025), the polyphenol content ranged from 0.8 to 42.1 mg of trioxyhydrobenzoic acid galop identical per g of dry weight (DW). Aqueous ginger extract was come across to have a total phenolic content of 23.5 mg gallic acid/g. The total phenolic content of the ginger 60% ethanolic extract was calculated by Rababah et al. (2004) to be 39.9 mg of chlorogenic acid equivalent/g DW (Prakash, 2010).

Biological Role of Tumeric

An overview of turmeric's chemical makeup is given in this review, with a focus on the plant's primary bioactive ingredients, curcuminoids, and volatile oils. The most prevalent curcuminoids in turmeric, curcumin, has been the subject of considerable study caused of its wide range of biological activities, which include anti-inflammatory, antioxidant, and anti-cancer properties. Curcumin can affect several signaling pathways implicated in carcinogenesis, as shown by several in vitro and in vivo studies. This can result in the hampering of cancer cell growth, the activation of apoptosis, and the subduing of metastasis (Prasad and Aggarwal, 2011).

Curcumin has demonstrated encouraging promise as a radioprotective drug by reducing DNA damage and oxidative stress brought on by radiation. Furthermore, studies have shown that curcuminoids, which are found in turmeric extracts, have strong antioxidant properties that scavenge free radicals and shield cells from harm caused by oxidative stress. Turmeric's diverse pharmacological characteristics make it a good option for the creation of innovative therapeutic approaches for managing the effects of oxidative stress-related illnesses as well as the prevention and dealing with cancer (Cozmin et al., 2024).

The synthetic drug-based treatment now in use is costly and alters metabolism and genetics. To limit the development and course of the condition, however, a sound and safe treatment plan is required. Medicinal plants and their components contribute significantly to managing diseases by modifying biological processes. The rhizome of Zingiber officinale, or ginger, has long been used therapeutically to manage health issues and is thought to have chemopreventive properties. Much research using animal models and clinical trials has demonstrated the important function ginger and its ingredients play in disease prevention by altering genetic and metabolic activity (Rahmani et al., 2014).

Biological Role of Ginger Root

For millennia, people have used herbs in traditional healthcare and cooking (Gupta et al., 2024). The hot water extract from ginger peels shows great promise as an antioxidant, antibacterial, antiradical, and anticancer agent. Since ancient times, ginger has been used extensively in Chinese, Ayurvedic, and Unani medications and home remedies to cure various

illnesses, including inflammation, pain, and gastrointestinal issues. Because of its anti-inflammatory properties, it is also well-known as a common alternative therapy treatment for vomiting and nausea during pregnancy. Biologically active chemicals have been identified through phytochemical investigation (Grabsi et al., 2024).

Phytochemical Composition

More than 60 different chemicals make up the complex molecule known as ginger. Oleoresin, a combination of essential oil and resin, is found in the rhizome of ginger. The essential oil's makeup varies depending on where it comes from, but its main ingredients are 6 the distinctive scent is caused by sesquiterpene hydrocarbons, which are identified by (Bhat et al., 2013). The primary phenolic compound is gingerole, which breaks down to produce zingerone, paradol, and shogaols (Toor et al., 2023). Small levels of gingerone and shogaols can be found in raw ginger, whereas greater amounts can be found in dried or separated products (Srivastava et al., 2000).

During this process, gingerols are also converted into the less pungent molecule gingerone, which has a spicy-sweet scent (Kumar et al., 2013). Other sesquiterpenoids that have been found in smaller proportions include alpha-pinene, limonene, zingerone, batabeasabolene, alpha paradol, farnesene, and the monoterpenoid fraction (β-phellandrene, cineol, and citral). Gingerenone is one of a unique class of chemicals found in ginger known as diasyleheptanoids. Ginger also has a very small quantity of curcumin. (Kumar et al., 2013)

Furthermore, it has trace levels of cardinolides, alkaloids, tannins, carotenoids, saponins, flavonoids, and steroids (Ajith et al., 2007). Fresh ginger oil has a higher concentration of oxygenated chemicals in its composition than dried ginger oil, which gives it greater potency. Dry ginger oil has a higher concentration of hydrocarbon components than fresh ginger oil. Sesquiterpene molecules lack the activity of monoterpene compounds. Sesquiterpene hydrocarbons, which are found in greater concentration in dry ginger oil, are also said to be less active than those found in oxygenated compounds (Srivastava et al., 2006). Sesquiterpene hydrocarbons, such as β-sesquiphellandrene (27.16%), caryophyllene (15.29%), zingiberene (13.97%), α-farnesene (10.52%), and others, are highly present in ginger oil (GEO). Ginger oil (GEO) has been characterized to have a high content of sesquiterpene hydrocarbons, including β-sesquiphellandrene (27.16%), caryophyllene (15.29%), zingiberene (13.97%), α-farnesene (10.52%) and curcumin (6.62%) (El Baroty et al., 2010).

A warm, humid atmosphere is best for growing ginger. Another use for ginger is as an ornamental plant (Retana-Cordero et al., 2022). The ginger plant is an intriguing and notable decorative plant with its patterned foliage, sweetly fragrance blossoms in a rainbow of hues, and startling seed pods. Grown for ornamental and therapeutic purposes only, rather than as spices, are Cautleya, Globba, Roscoea, Kaempferia, and Siphonochilus (Branney, 2005). The crop is ready for harvesting when the leaves begin to progressively wither and turn yellow (Toor et al., 2024). The plants utilized for this might have been gathered even later because the proportion of essential oils of rhizomes rises with age. Harvesting is carried out either by machine diggers or by hand using a digging fork or spade. However, South India, Australia, and Jamaica produce the priciest and best varieties (Ali and Gilani, 2007).

There are at least forty antioxidant chemicals found in ginger. Following thirty studies, it was listed as one of the fourteen types of vegetables with the greatest antioxidants, along with broccoli, Brussels sprouts, mint, coriander, and turmeric.

Conclusion

Our results show that several spices have significant and variable action against a range of species, suggesting the presence of antimicrobial capabilities in natural items such as turmeric and ginger. The greatest inhibitory activity against a variety of isolates was demonstrated by ginger. Because of its many phytotherapeutic benefits, ginger is a vow herb that is used all across the world. The ginger extract under analysis contained bioactive chemicals with significant biological applications. The term "Mahaushdi" in Ayurveda refers to the herb's ability to enhance bodily processes and aid in the elimination of toxins from the body. I noted that ginger has a wide range of medicinal benefits, which include as direct anti-inflammatory effects, the capacity to avoid the synthesis of inflammatory chemicals, and antibiotic, antibacterial, and antioxidant activities. In addition, ginger helps lower cholesterol, promotes blood circulation, regulates blood pressure and hypertension, and is associated with the prevention of several malignancies and cardiac muscle issues. Plant medication development employs a multidisciplinary approach that combines botanical, ethnobotanical, phytochemical, and biological methods. As stated by the World Health Organization, more than 75% of people worldwide use traditional medicine. They have been used for health reasons throughout the world for a very long time as folk and traditional medicines. As a result, because of their safety, efficacy, absence of adverse effects, and cultural acceptability, herbal remedies have been used for millennia.

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