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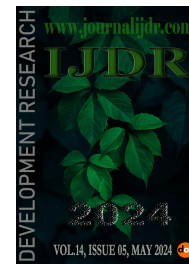
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REVIEW ARTICLE

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A REVIEW ON ZINGIBER OFFICINALE (GINGER)

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ABSTRACT

Zingiber Officinale, commonly referred to as "Ginger" The plant's therapeutic qualities, including its anti-inflammatory, antidiabetic, and antibacterial qualities, are caused by a variety of compounds. Ginger has several uses in food preparation, medicinal, flavoring, and spices. Its pH range is 5.6 to 5.9. Old and rotten ginger is made to look appealing by washing it in sulfuric acid, which is highly dangerous to eat and can cause kidney stones, liver problems, stomach burns, and other problems. Ginger has been used medicinally for over 2,000 years, making it one of the most adaptable plants with a broad range of biological effects. It is also frequently used as a condiment for a variety of dishes and drinks. Among the active ingredients that give it its therapeutic properties include gingerol, paradol, and shagaols. There is currently a renaissance of interest in ginger, which has prompted a plethora of scientific research endeavors intended to identify its active ingredients, validate its pharmacological effects, and investigate its potential for treating a range of illnesses. This article aims to present a thorough summary of recent research discoveries about Zingiber Officinale, including its phytochemical composition, biological activities, pharmacological actions, and ethanobotanical insights. Ginger is also listed in Ayurveda as one of the key ingredients to help the body get rid of a cough. Ginger prevents colds, nausea, and high blood pressure, among other health advantages.

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INTRODUCTION

For a very long time, people have used ginger (Zingiber Officinale Roscoe), a member of the Zingiber genus and family of plants, as a spice and herbal remedy. Due to its ethano-medicine properties, ginger is used extensively in both culinary and medicinal contexts worldwide. Complementary medical systems like Ayurveda, Siddha, Unani, Homeopathy, and Chinese medicine, among others, recommend Z. Officinale alone or in combination for both infectious and non-communicable diseases. The plant's antibacterial, anticancer, antioxidant, antidiabetic, nephroprotective, analgesic, and anti-inflammatory properties are the main areas of research. Ginger is a rich source of antioxidants, which shield DNA from oxidative damage and stress. They may support healthy aging and help the body fight long-term ailments like heart disease, lung illnesses, and high blood pressure. For thousands of years, people have used ginger, the root or rhizomes of the zingiber officinale plant, as a spice and herb. Herbal cultures of Asia, India, and Arabia have long used it. For instance, ginger has been used for more than 2,000 years to cure nausea, diarrhea, and upset stomachs in China. In addition, ginger is utilized to treat cardiac conditions, colic, arthritis, and diarrhea. Ginger is mostly advised in Ayurveda to increase appetite, relieve constipation, clear the throat and tongue, balance circulation, improve digestion, dissolve calculi, be nutritious, improve voice, ease cough and asthma, be analgesic, aid in the absorption of water through the alimentary canal, relieve coldness, manage pain, and stimulate the nerve.

Ginger is widely used to treat a variety of ailments, including appetite loss, asthma, bloated stomach, rheumatoid arthritis, anemia, liver-related conditions and disorders, fatigue, back pain, vomiting, swollen joints, maldigestion, mal-absorption syndrome, stomach, piles, weakness in the heart, heart problems, throat-related disorders, etc.

Plant Description: Ginger is an underground stem that is thick and beige-brown in colour, known as rhizomes. Its stems, which have long, narrow, ribbed, green leaves and a white or yellow-green flower, reach to a height of around 12 inches above the ground.

Applications for Ginger:

- Intestinal gas and bloating can be reduced by eating ginger, which also reduce fermentation and constipation.
- Elevate blood glucose levels.
- There are antioxidants in ginger. These molecules aid in the control of free radicals, which are substance that can harm cells in excess of their numerical value.
- Women have long extolled the virtue of ginger's ability to relieve pregnancy-related nausea, including "ginger is recognized as an effective non-pharmaceutical treatment for nausea and vomiting even by the American Academy of Obstetrics and Gynecology.
- Cut down on inflammation.
- Ginger has flavouring stimulant, carminative, fragrant, an stomachic properties
- It has been suggested that ginger helps with motion sickness.

Health Benefits

1. Helps to fight Diabetes
2. Has anti-inflammatory properties
3. Lowers cholesterol levels
4. Helps to maintain brain health
5. Helps to mitigate digestive problems
6. Helps clear throat and respiratory issues
7. Helps to migrate digestive problems
8. Helps to maintain brain health

Active constituents

- Gingerol
- Shagol
- Zingiberene
- Zingerol
- Phellandrene
- Bisabilone
- Starch
- Trace amount of Ca, Mn, Fe, Cu, K

Plant Profile

Zingiber Officinale (Ginger)



Synonyms: Zingiber; Zingiberis.

Biological Source: Ginger consists of the rhizome of *Zingiber Officinale* roscoe, it is marketed as Jamaican Ginger.

Family: Zingiberaceae.

Geographical Source: It is said to be East Asian, but it is grown in the Caribbean Island, Africa, Australia, Mauritius and India.

Taxonomical Classification

| | |
|------------------|-------------------------------------|
| Botanical Origin | : <i>Zingiber Officinale</i> |
| Kingdom | : Plantae |
| Subkingdom | : Tracheobionta |
| Super-division | : Spermatophyta |
| Division | : Magnoliophyta |
| Class | : Liliopsida Monocotyledons |
| Subclass | : Zingiberaceae |
| Order | : Zingiberales |
| Family | : Zingiberaceae |
| Genus | : <i>Zingiber</i> P. Mill |
| Species | : <i>Zingiber Officinale</i> Roscoe |

Medication Uses and Indication: These days, medical specialists could advise using ginger to cure or prevent nausea and vomiting

related to chemotherapy for cancer, pregnancy and motion sickness. It is also used to treat mild upset stomachs, lessen osteoarthritis pain, and possibly even cardiac problems.

Motion Sickness: Uses and Indications for Medicine: Nowadays, doctors may advise using ginger to cure or prevent stomach flu, nausea and vomiting associated with pregnancy, and cancer prevention. Additionally, it can be used to treat cardiac conditions, lessen pain from osteoarthritis, and alleviate mild stomach discomfort. While not all research support it, many do indicate that ginger may be more effective than a placebo at easing some motion sickness symptoms. In one study, participants who took powdered ginger instead of a placebo experienced a reduction in vomiting and cold sweats, a condition common among 80 novice sailors who were prone to motion sickness. Their sickness did not go away with ginger. However, the same result was seen in a study with healthy participants. Other research, however, has demonstrated that medicines are a more effective way to alleviate pain than ginger. In a single short trial, subjects received scopolamine, a drug used to treat inflammatory bowel disease, the new root or powder, or a placebo. When scopolamine was taken, symptoms were less common than when ginger was taken. Ginger does not have the same adverse effects as prescription or over-the-counter drugs that are used to relieve nausea, such as sleepiness and dry mouth.

Pregnancy related nausea and vomiting: According to human research, giving pregnant women one gram of ginger daily for a maximum of four days will help them feel less queasy and nauseous. Numerous studies have demonstrated the superiority of ginger over placebo in the treatment of morning sickness. For example, a short-research with thirty pregnant women experiencing severe vomiting found that those who took one gram of ginger daily for four days experienced less nausea than those who took a placebo. Similar dosages of ginger were associated with reduced nausea and vomiting than a placebo in a major-research involving seventy pregnant women who were experiencing symptoms of nausea and vomiting. Ginger should not be consumed by pregnant women more than one gram per day and they should speak with their doctor before doing so.

Chemotherapy Nausea: Ginger has been shown in some trials to lessen the intensity and length of nausea experienced while taking painkillers, but it has no effect on vomiting. However, one trial used ginger with additional antiemetic drugs. Thus, determining whether ginger is good or not is difficult. Further investigation is required.

Nausea and vomiting after surgery: Studies look at the benefits of ginger in preventing post-operative nausea and vomiting. One gram of ginger root taken prior to surgery was shown in two tests to minimize nausea just as much as the parent medication. According to one study, women who took ginger after surgery also need anti-nausea medication. However, research has indicated that ginger does not lessen nausea. In fact, a study discovered that ginger may induce post-operative vomiting. Further investigation is required.

Osteoarthritis: Ginger has long been used in traditional medicine to treat pain. Ginger may help lessen osteoarthritis pain, according to some evidence (QA). In comparison to individuals receiving a placebo, those taking ginger extract twice daily reported using less pain medication in a research including 261 patients with osteoarthritis in their knees. A different study discovered that ginger had no greater effect on OA symptoms than ibuprofen (Advil, Momtrin, and Advil) or a placebo. Ginger will not start to work for a few weeks.

Prevent Nausea: If you're feeling queasy or like you want to throw up, ginger is a natural cure you should try. If you think you might throw up, you can get some nausea relief in a few minutes by chewing ginger or sipping warm tea. And chewing some raw ginger or just sipping a hot cup of ginger tea will reduce your chance of getting cancer. Again, ginger is helpful if you are felling queasy from motion sickness. Ginger has many advantages, chief among them

being its ability to effectively combat nausea and its safety when used during pregnancy.

Other uses: According to preliminary research, ginger may help prevent blood clotting and reduce cholesterol. This can aid in the treatment of heart disease, which can obstruct blood vessels and result in a heart attack or stroke. According to additional research, ginger may assist type 2 diabetics better regulate their blood sugar levels.

Precaution

- Herbal medicine is traditional method of promoting health and curing illness. Herbs, however, can have adverse effects and interact with drugs, vitamins, and other herbs. For these reasons, it is best to use herbs under the guidance of a medical professional who specialized in botanical medicine.
- Ginger rarely causes negative side effects. When taken in large quantities, it might induce mild heartburn, belching, and oral irritation. If you take ginger with meals or as a supplement, you may be able to prevent some of the moderate side effects of ginger, like heartburn, belching, and upset stomach.
- Before eating ginger, those with gallstones should see their doctors. Make sure you inform your physician if you are consuming ginger prior to surgery or being sedated.
- Individuals with diabetes, heart disease, and those who are pregnant or nursing should not take ginger without first seeing their physicians.
- If you take blood-thinning drugs, such as aspirin, or if you have a bleeding issue. DO NOT consume ginger.

Macroscopy: Morphological characters of Ginger plant are:

Rhizome: Mostly horizontal and tuberous.

Leafy stem: Elongated leaves; oblong-lanceolate in shape and twisted into the stem by a sheath.

Spikes: Usually radial, but they can also appear on the petioles' tips or sides. The peduncle can have one or more single.

Calyx: Cylindrical, with a shot three-lobed structure.

Ovary: Three cells containing many overlapping ovules; The style is filamentous, the stigma small and almost spherical.

Capsule: Rectangular, eventually opens.

Seeds: Large, spherical and covered with grains.

Rhizomes: Thick, tuber-like, with upright leaf-like stems, varying in height from 0.6 to 12 meters.

Leaves: Narrow, arranged in two rows, almost sessile on the sheath, linear-lanceolate, usually 1 to 2 cm wide, smooth.

Flowers: Green, with small flower lips, dark purple or purple-black lips, occurring in root-like spikes 3.8 to 3.7 cm long and 2.5 cm in diameter, on stems 15-30 cm wide.

Stems: Dark purple, as long as the lip, but slightly shorter than the lip, crown.

Active Constituents: The following are some of the main chemical components (8-12) and their structure:

- 1-2% volatile oils: citral, citronellal, gingerol, bisabolene, borneol, cineole, phellandrene, zingiberene, linalool, limonene, camphene, and geranial
- One kind of sesquiterpene is bisabolene.
- Zingiberene: hydrocarbon sesquiterpene (6 percent). Phenol: zingerone and gingerol.

- Gingerol is and oily, smelly, yellow liquid that generates aliphatic aldehyde, gingerone, and a ketone.
- Oleo-resin: zingiberole, shogaol.
- Shogaol: Gingerol loses water to produce it.
- Zingiberole: alcohol with sesquiterpenes.
- Lipids (1-2%): triglycerides, lecithins, phosphatidic acid, and free fatty acids. Vitamins A, C, B6 (riboflavin), and B3 (niacin).
- Minerals include potassium, phosphorus, magnesium, and calcium. 2-3% of proteins, 50% starch.
- The alcoholic group of the oleoresin, gingerol (5 to 8%), is responsible for the pungent flavour of ginger. The volatile oils (1%-2%) in ginger-bisabolene, zingiberene, and zingiberole are responsible for its scent.

Pharmacological activities of Ginger: In addition to its culinary applications, ginger and its main ingredients are recognized for their advantageous medical qualities. Their value in the treatment has been supported by numerous pre-clinical trials of rheumatoid arthritis, diabetes, obesity, diarrhea, allergies, pain, fever, inflammation, and different types of cancer. In animal models, tumors produced in the colon, breast, ovaries, pancreas, liver, central nervous system, and cardiovascular problems have been successfully treated using ginger's physiologically active components.

Antioxidant Activity: Antioxidant activity may employ a number of techniques: (i) chelating metal ions to prevent them from producing reactive species or breaking down peroxides; (ii) scavenging species that start peroxidation. (iii) stopping the auto-oxidative chain process, and/or (iv) lowering the concentration of O₂ locally. One may think of ginger as the antioxidant reserve. Its remarkable ability to scavenge harmful oxidants such as peroxides, reactive oxygen species (ROS), and free radicals is one among its best qualities. Ginger's active components, which include zingerone, shogaols, and gingerols, among others, have antioxidant properties. It works by inhibiting xanthine oxidase, an enzyme that is primarily responsible for producing reactive oxygen species. According to reports, zingerone can shield in vitro DNA from oxidative damage caused by ROS generated by stannous chloride. Zingerone has a direct adaptogenic impact on intestinal smooth muscle via reducing oxidative stress.

Antimicrobial activity: Food safety regulators, the food business, and consumers are all very concerned about foodborne illnesses. To increase food quality and shelf life, a lot of work has been put into discovering natural antimicrobials that can prevent the growth of bacteria and fungi. Plant extracts have been utilized for a variety of reasons for a long time, and more recently, they have been examined for their potential use as food preservatives and alternative medicines. The pharmaceutical sector, alternative medicine, natural remedies, and the preservation of raw and processed food can all benefit from plant extracts and oils' antibacterial properties. Strong antibacterial and, to a lesser extent, antifungal qualities are present in ginger. Escherichia coli induced diarrhea is the leading cause of death in developing countries and recently it was documented that zingerone exerted protective effect on E. coli induced diarrhea.

Anti-diabetic activity: Diabetes is a metabolic illness that is a serious global health concern. It is brought on by abnormalities in the metabolism of carbohydrates, which are linked to low blood insulin levels or target organ insulin sensitivity. Severe tissue and vascular damage in untreated cases might result in major side effects such ulceration, retinopathy, neuropathy, nephropathy, and cardiovascular problems. According to recent research, its main active ingredient, gingerol, improved chronic diseases including diabetes by boosting insulin sensitivity and enhancing cell-mediated glucose uptake. When given to diabetic mice, the primary ingredient 6-gingerol also demonstrated hypoglycemic properties and enhanced defective insulin signaling in animals that had been exposed to arsenic.

Anticancer activity: Consumer awareness of the use of functional foods to prevent and slow the progression of cancer has increased due to the ongoing rise in cancer incidence. Over the past 20 years,

numerous researchers have identified the protective properties of ginger and its metabolites against a range of cancers and cell lines of the lung, colon, skin, pancreas, prostate, liver, ovary, colon, breast, kidney, etc. Applying a topically applied ethanolic ginger extract to mouse skin demonstrated a highly significant protective effect against the development of skin tumors, which was linked to the inhibition of the induction of epidermal ornithine decarboxylase, cyclooxygenase, and lipoxygenase activities caused by 12-O-tetradecanoylphorbol-13-acetate (TPA). Similar action was shown for [6]-gingerol in a later investigation. According to recent research, zingerone may have anticancer properties. It has been demonstrated that zingerone supplementation significantly reduced the incidence of tumors and the creation of aberrant crypt foci in rats treated with dimethyl hydrazine. It also modulated the levels of tissue lipid peroxidation and antioxidant status in the same way. Another significant study has demonstrated that 6-shogaol exhibits anticancer properties against breast cancer by reducing the production of matrix metalloproteinase-9 and inhibiting cell invasion.

Anti-inflammatory activity: The body uses inflammation as a host defense mechanism and as a vital immunological response to keep tissues at homeostasis in toxic environments and to survive infections or injuries. A limited protective response of the body's cells and tissues to an allergy or chemical irritant, an injury, or an infection is called inflammation. A recent study showed that a dried ginger methanolic extract's hexane fraction had anti-neuroinflammatory effect by suppressing the expression of proinflammatory genes in LPS-activated BV2 microglial cells. By inhibiting prostaglandin synthase or 5-lipoxygenase, gingerol and structurally related pungent components of ginger, such as shogaol, have an inhibitory effect on the formation of prostaglandins and leukotrienes. Fresh ginger eating has shown encouraging benefits in reducing arthritis-related symptoms in humans. These findings suggest that ginger may have anti-inflammatory and therefore anti-pain properties.

Analgesic activity: Additionally, it has been demonstrated that [6]-shogaol increases the nociceptive threshold of the yeast-inflamed paw and prevents mice from writhing when exposed to acetic acid.

Anti-pyretic: When given orally (100 mg/kg), a Soxhlet extract of ginger in 80% ethanol decreased yeast-induced fever in rats by 38%. At the same dosage, this was similar to the antipyretic action of acetylsalicylic acid. The temperature of the normothermic rats was unaffected by the ginger extract. Possible mediating mechanism for this antipyretic action: COX inhibition.

Renoprotective activity: 6- In rats, gingerol exhibits renoprotective action to reduce oxidative stress and renal impairment brought on by cisplatin. At doses of 12.5, 25, and 50 mg/kg, respectively, the chemical helps restore renal functions, lower lipid peroxidation, and increase the levels of reduced glutathione, superoxide dismutase, and catalase activities.

Anti-emetic activity: The most popular herb for treating nausea and vomiting during pregnancy is ginger, which women can take on their own or as prescribed by healthcare professionals. That would be significantly higher more effective than vitamin B6 at reducing the intensity of nausea and just as effective at reducing the frequency of early pregnancy vomiting episodes. Research using an animal model showed that the anti-serotonergic and 5-HT₃ receptor antagonistic properties of ginger extract are significant in the pathogenesis of postoperative nausea and vomiting. An investigation supporting the benefits of ginger in treating nausea and vomiting has shown that it can reduce the intensity of these symptoms.

Neuroprotective activity: The components of ginger are essential as neuroprotectors. It is unclear how ginger works in this particular situation. However, it's believed that ginger displays because of the phenolic and flavonoid components, there is a neuroprotective effect. According to a significant study, 6-shogaol inhibits microglia to have neuroprotective benefits in acute global ischemia. Another study supporting ginger's role as a neuroprotector reveals that it has a

neuroprotective impact by speeding up the brain's defense systems against free radicals and bringing the levels of MDA in diabetic rats back to normal.

CONCLUSION

Zingiber officinale, or ginger, is recommended by Ayurveda to treat a variety of medical ailments, despite noting Current view points on the benefits of antioxidants, antivirals, radioprotectants, and anti-inflammatory agents. However, there is a solid body of research supporting the use of ginger in a variety of conditions, including those with related symptoms or complications, according to historic Ayurvedic texts. Current developments in phytochemistry and ethnomedicine provide detailed applications of ginger for physiological requirements, carcinogenic situations, and viral infections. A comparison of Ayurvedic literature's advice for the use of ginger medicinally could be used in contemporary settings to promote health and avoid disease. Ginger has been used historically due to its many natural medicinal properties, especially as an antiemetic. The best data to date indicates that ginger is a cost-effective, safe, and effective treatment for nausea and vomiting. It artificially caused mutations, each with unique dangers and limitations, when it comes to ginger, the remarkable spice and medicinal plant that is greatly hindered by a lack of seed set.

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