



## **Medicinal Properties of *Zingiber officinale***

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### **Authors' contribution**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

*Zingiber officinale* stands in the family Zingiberaceae. Ginger has rich phytochemistry plays a very pivotal role in health promotion. This research is aimed to review the current evidence on the various medicinal properties of ginger. Ginger is known to exert a wide range of pharmacological as well as physiological activities. Since time immemorable, it has been in use for the medicaments of various illnesses, like colds, headache, sore throat, migraines, hypertension, arthritis. Owing to this, this plant's pharmacological and medicinal properties have been a popular topic of review and research. This herb shows several puissant preventive and therapeutic actions and finds its extensive usage for ages to the present day for numerous ailments. Ginger exhibits potent anti-inflammatory and analgesic effects, which help decrease swelling, pain, and inflammation. One of the known and the most frequent usage of ginger has been to relieve the patients of nausea and vomiting. Ginger works as an antiemetic and is recommended to prevent sea sickness and motion sickness. It relieves motion sickness more effectively than specific drugs. *Zingiber officinale* has been identified to reduce pain. Ginger powder plays an influential role in mitigating the symptoms of primary dysmenorrhea. Experimental studies have confirmed ginger's role in reducing blood glucose levels improvement of hyperlipidemia. Ginger extract has been instrumental in reducing the structural abnormalities of heart in diabetic and helps improve the levels of serum apo, cathepsin G, leptin, Hcy and with anti oxidative effects of extract from ginger. Ginger supplementation enhances testosterone production in males, particularly in oxidative stress conditions.

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## 1. INTRODUCTION

Over the last few years, the use of natural and alternative medicine has greatly increased. More and more people are opting for natural remedies. Ginger is one of the only commonly used condiments within the world. It stands in the family Zingiberaceae in the hierarchy of classification. It was first found in Southeastern part of the Asian continent, and since that time, it has been used in nations all over the globe as a spice and condiment to add flavor to their food and enrich its taste. Other than adding flavors to tea and food ginger also has many medicinal properties used since time immortal. A part of this plant known as rhizome has also been used in traditional herbal medicine.

Its present name comes from the word 'gingivere' of Middle English. Over 3000 years back, this spice was referred to by its Sanskrit name 'srngaveram,' which translates to 'horn root.' It is so named because of its appearance. Ginger is known to exert a wide range of pharmacological and physiological activities. Since ancient Sushruta times, it has been used to treat several ailments, severe being hypertension and arthritis, which are very common these days. Owing to this, the pharmacological and medicinal properties of this plant have been a popular topic of review and research [1-4].

## 2. METHODS

This research has been completed by searching PubMed for related publications on 'ginger' and its 'medicinal properties' as keywords. This research has considered papers published without any filters.

## 3. MEDICINAL PROPERTIES OF GINGER

**Antioxidant:** This herb is known to exert an array of powerful preventive and remedial effects. It finds its extensive usage from ages to the present day for numerous ailments from colds to cancer [1,2]. The human body is prone to oxidative stress. The generation of free radicals leads to many ailments [3]. Studies on Rat presents that ginger has an antioxidant effect it toin C [4]. The healing capacity and power of the leaves and budding stem of *Z. officinale* (Halia Bara) were validated by Ghasemzadeh, and therefore the association between the total composition of phenolic compounds and

antioxidative activities in ginger is positive. It has been reported to lower down the peroxidation of lipids [5,6]. It saves the levels of reduced glutathione. Reactive nitrogen species, like nitric oxide (NO), lead to DNA damage, which contributes to several diseases and ginger comes handy as it inhibits NO production [7]. Ginger plays a role in reducing lipid peroxidation, and supplementation of ginger before ischemia and reperfusion lead to a higher total antioxidant capacity. In an ethanol-phosphate buffer solution, the dichloromethane extract of a ginger rhizome has a nonvolatile fraction which demonstrated suitable antioxidant property by using linoleic acid [8]. Using chromatographic methods, five gingerol-related chemicals and eight diarylheptanoids were recruited by purifying the fraction. Twelve of them outperformed - tocopherol in terms of activity. The benzene ring's side chain configurations and substitution patterns were most likely determined the activity. The bit part of oxidative stress in numerous diabetes issues has been established. The main target of this study was to see how ginger, affected the antioxidant defense system of tissues and the status of lipid peroxidation in diabetic rats which were streptozotocin induced. Diabetes mellitus is linked to a rise in reactive oxygen species and a fall in antioxidant activity, which is the main factor behind the pathogenesis of diabetes. Ginger's potential as an antioxidant marker of two organs- kidney and liver was studied. The antioxidant activities of ginger and glibenclamide, a popular hypoglycemic treatment, were weighed up. Diabetic rats have reduced superoxide dismutase activity, catalase (CAT), glutathione peroxidase (GPx), and glutathione reductase (GR), as well as lower content of glutathione (GSH) and greater levels of malondialdehyde (MDA) in liver and kidney than healthy rats. In diabetic rats treated with ginger, the activities of all indices, except MDA, were shown to be enhanced in liver and kidney tissue. Treatment with ginger in diabetic rats for 30 days led to substantial hypoglycemic and antioxidant effects that were dose-related. These data imply that ginger medication has a curative impact on diabetes by reducing oxidative stress and damage to the kidneys and liver [9,10].

**As an anti-inflammatory:** Ginger exhibits potent anti-inflammatory and analgesic effects, which help decrease swelling, pain and inflammation. It was reported by Habib et.al. That extract from ginger can mitigate the increased impression of

NFκB TNF-α in Rats suffering from hepatic carcinoma. Ginger has been effective against rheumatism and osteoarthritis. Many laboratories worldwide have offered science based evidence for the time-honored assumption that ginger-the herb has antiinflammatory components over the last 25 years. The prostaglandin inhibitory effect of this herb were discovered in the 1970s and has been frequently verified [11,12]. Ginger was found as a herbal medicinal substance having pharmacological effects similar to nonsteroidal anti-inflammatory medications in this study. Ginger inhibits prostaglandin formation by inhibiting cyclooxygenase-1 and cyclooxygenase-2. The discovery that ginger inhibits leukotriene production by inhibiting 5-lipoxygenase significantly expanded this early work. A watery extract from this medicinal plant was tested for its effect on serum cholesterol and triglyceride levels and the synthesis of platelet thromboxane-B2 and prostaglandin-E2. Around four weeks, rats were given a raw wash extract of ginger either orally or intraperitoneal. The levels of thromboxane-B2, prostaglandin-E2, cholesterol, and triglycerides in fasting blood serum were measured. Compared to saline-treated mice, a pretty less dose of around (50 mg/kg) of ginger was delivered orally or intravenously but produced no notable reduction in serum levels of thromboxane-B2. On the other hand, oral ginger caused considerable alterations in serum levels of PGE2 at this dose. Comparatively when a high dose of ginger of around 500mg/kg was delivered, no adverse effects were seen. Only when ginger was delivered intravenously (IP) did a noteworthy reduction in serum cholesterol was noticed at a seemingly low dose of ginger (50 mg/kg). There were no notable changes in triglyceride serum levels when either dose of ginger was administered. These findings imply ginger may be helpful as a cholesterol-reducing, antithrombotic, and anti-inflammatory agent [13,14].

**For nausea and vomiting (as antiemetic):** One of the known and the most frequent usage of ginger has been to relieve the patients of nausea and vomiting. Ginger works as an antiemetic and has been recommended for preventing sea sickness motion sickness. It relieves motion sickness more effectively than certain drugs. Even though the use of ginger for relieving nausea and vomiting has been contraindicated over its effectiveness, its use is still quite widespread, specifically in chemotherapy, pregnancy, and post-operative surgical process-

induced nausea and vomiting. Zero differences in gestational age, birth weight, or birth abnormalities have been reported between pregnant women treated and untreated with ginger [15]. A randomized, controlled equivalency trial including 291 women who were less than 16 weeks pregnant was conducted at an Australian teaching hospital. For three weeks, they consumed 1.05 g of ginger. Differences in nausea and vomiting frequency were calculated for both groups on the 7<sup>th</sup>, 14<sup>th</sup>, and 21<sup>st</sup> days. Ginger was found to be equal to pyridoxine in terms of lowering nausea, retching, and vomiting, with no indication of distinct effects at the three-time periods. Thus it can be considered a household treatment for nausea, dry retching, and vomiting in women [16,17].

**To reduce blood-glucose and serum cholesterol,** present-day lifestyle diseases like hypertension, hyperlipidaemia, type-2 diabetes, and cardiovascular diseases have been central. Regular exercise and effective food habits help mitigate the effects of these diseases. However, lack of time and extended working hours limits such a schedule. However, surgery is one option but is not widespread due to its risk. This has led to people shifting to alternative medicine systems and precisely the natural remedies to cope up with obesity and various other lifestyle related diseases [18,19]. Experimental studies have confirmed ginger's role in reducing blood glucose levels improving hyperlipidaemia by decreasing serum cholesterol and triglyceride. Gingerol present in ginger appears to stabilize adipocyte hormones, plasma, lipases, and lipid profile in high fat-induced experimental animals. Alcohol-induced hyperlipidemia is correlated to a higher risk of diseases of the CVS. Many herbal extracts have been shown to protect against heart damage and lower down hyperlipidemia. The efficacy of ginger extracts on this type of hyperlipidemia and related cardiac destruction, on the other hand, is not yet known. This study aimed to look into the cardioprotective qualities of ethanol ice ginger extract (Gt) against myocardial damage induced by alcohol and the relationship between hyperlipidemia and the occurrence of myocardial damage in rats. Wistar male albino rats around 24 in number were sorted out into four groups: standard control (NC), ginger treated (G), and placebo-treated (P), Alcohol treated (At), and Alcohol plus Ginger treated (At+Gt). Lipid profiles include fatty acids, triglycerides, total cholesterol, phospholipids, low-density lipoprotein(LDL), high-density lipoprotein(HDL), and cardiac biomarkers such

as LDH AST, and CK-MB, cTn-T, and cTn-I, were evaluated in rats in this study. Histological and pathological examinations were also carried out. It was discovered that alcohol-induced cardiac injury was related to an elevated lipid profile, except HDL, in alcohol-treated (20%, 6g/kg b.w.) rats compared to control rats. Ginger therapy dramatically lowered the alcohol-induced lipid profiles except for high-density lipoproteins. Rats juxtaposed with standard control in alcohol-treated (20%, 6g/kg b.w.). Furthermore, ginger therapy remarkably lowers down increased cardiac biomarker activity associated with alcohol intoxication. Furthermore, a 7-week ginger treatment dramatically reduced alcohol-induced myocardial damage [19].

**For diabetes:** Diabetes has turned out to be the disease of the present age. The major issue with diabetes is that it aggravates the effects of other underlying diseases precisely the cardiovascular complications leading to death and accounts to around 65% deaths due to heart failure and vascular abnormalities. Diabetes leads to abnormalities like fibrosis, apoptosis, autonomic neuropathy, hypertrophy, alterations in the transport of Ca<sup>2+</sup> along with alterations in the homeostasis of intracellular Ca<sup>2+</sup>. Ginger extract in diabetic patients shows a significant increase in the levels of plasma C-reactive protein(CRP), homocysteine(Hcy), cathepsinG and apoB levels and the levels of apoB and leptin decrease when compared to the non-treated population. Ginger extract has been instrumental in reducing the structural abnormalities of heart in diabetic and helps in improving the levels of serum apo, leptin, cathepsin G, and Hcy and with the antioxidant properties of ginger extract [20].

**For pain:** *Zingiber officinale* has been identified to reduce pain. Ginger powder plays an effective role in mitigating the symptoms of primary dysmenorrheal pain which women undergo during the start of their menstrual cycle. A study conducted in 2010 presents that ginger is an excellent pain reliever for human muscle pain resulting from injury induced from exercise such that people experienced reduced pain and inflammation. The most frequent kind of arthritis and musculoskeletal disorders is knee osteoarthritis. Because synthetic drugs have a low efficacy and significant side effects for the treatment of this illness, many research experts are searching for drugs which, in addition to their efficacy, have lesser adverse effects, and ginger has lately become one of the most famous and well known herbal remedies in the cure of this

disease in controversial studies. The purpose of this study was to see how ginger affected pain and satisfaction in those who had knee osteoarthritis [20,21].

A clinical trial was carried out in this investigation. A total of 90 patients suffering with osteoarthritis of the knee were randomly put into one of the two groups: ginger or control. Furthermore, treatment was planned ahead of time. The start and finish of the twelfth week. Before the intervention, there was no significant difference in pain scores between the two groups; however, following the medication, pain levels decreased in both groups, but more in the ginger group. With regard to treatment satisfaction, a remarkable difference between the two groups was seen, with the group receiving ginger scoring higher. The incidence of adverse effects, on the other hand, was not statistically remarkable and considerable between the two groups. According to the findings of the above mentioned study, ginger is beneficial in alleviating pain in individuals with osteoarthritis of knee and can be used as a guarded technique [21].

**To enhance testosterone production:**

Testosterone is the primary sex hormone in males and scientists have focused their efforts in finding ways and means to enhance its production and to safeguard the hormone. Numerous dietary supplements were tried and tested for enhancing the production of testosterone. Many in-vivo and simple research studies have found out a connection between this hormone and ginger, though it has not been collectively reviewed. The research demonstrates that ginger supplementation enhances production of testosterone in males particularly in oxidative stress condition by improving the production of luteinizing hormone (LH), enhancing the cholesterol levels in testes, lowering and reducing the oxidative stress and peroxidation of lipids in the testes, improving the action of antioxidant enzymes, enhancing the amount of vascular supply to the testes, normalizing blood glucose, increasing the weight of testes, and by recycling the testosterone receptors. Still, it has not been confirmed yet that ginger does have these effects on testosterone in humans [21]. A longitudinal or panel study that comprised of 75 men who were infertile, all within the age group of 19-40 years. All these men with infertility had been married for at least two years and did not have children. The samples for this study were obtained from an infertile clinic in

Tikrit teaching hospital, private clinics in the city of Kirkuk, between the dates 1-10-2011 to 1-5-2012. This above mentioned study involves the use of ginger for the treatment of infertile men. The treatment was carried out for three months during which at least 2-3 semen samples were analysed for each patient before coming to a final conclusion regarding the baseline sperm parameters. Using ELISA the serum concentrations of FSH, LH and testosterone were measured. A significant increase in the sperm count of infertile men was found when compared to the sperm count before starting the treatment with ginger. The sperm count increased by up to 16.2%. The study also recorded a significant rise in the sperm motility as compared with before treatment. The sperm motility increased by up to 47.3%. Furthermore there was also a remarkable increase in sperm viability and normal sperm morphology. The sperm viability increased by up to 40.7%. The study observed significant rise in the ejaculated volume as compared with before treatment. The ejaculatory volume of infertile men increased by up to 36.1%. When compared with before treatment the infertile men showed a significant reduction in serum MDA and significant increase in serum glutathione [21]. There was also noteworthy rise in levels of FSH, LH, testosterone in the serum of these infertile men after treatment. Thus, the above mentioned study brings us to the conclusion that after treatment with ginger there was an increase in the FSH, LH and testosterone levels and a fall in the serum level of MDA. There was also a rise in the serum glutathione and reduced MDA in the serum as well as the seminal fluid when the semen samples of the same infertile men were analysed after the completion of treatment [21-32].

#### 4. CONCLUSION

Studies have shown ginger to possess a diverse variety of pharmacological properties which have been used for various purposes since a long time. In conclusion, the use of ginger as a medicinal herb to deal with the symptoms of a number of disorders has been found to be safe and effective despite a lack in mechanistic information.

#### NOTE

The study highlights the efficacy of "Herbals" which is an ancient tradition, used in some parts of India. This ancient concept should be carefully

evaluated in the light of modern medical science and can be utilized partially if found suitable.

#### CONSENT AND ETHICAL APPROVAL

It is not applicable.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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