
Review of Pharmacological Activity of *Zingiber Officinale*

Deepak Abhichandani, Manoj Goyal *, Sandeep Kumar Yadav, Kumkum Mathur, B. P. Nagori

Lachoo Memorial College of Science and Technology, Pharmacy Wing, Jodhpur, 342008, Rajasthan, India.

*Correspondence: manojgoyal620@yahoo.com

ABSTRACT

Zingiber officinale (family: Zingiberaceae) is best known as pungent and aromatic spice ginger. The Ginger has many medicinal uses, various pharmacological studies reported anti-inflammatory, anti-microbial, anti-migraine, anti-emetic, anti-ulcer anti-cancer and anti-diabetic activities. There are immense possibilities for using *Zingiber officinale* along with modern medicine for treatment various ailments.

Keywords: *Zingiber officinale*, ginger, analgesic, anti-inflammatory, antiemetic

INTRODUCTION

Zingiber officinale (family: Zingiberaceae) consist of whole or cut, dried scrapped or unscrapped rhizomes of *Zingiber officinale*. It well known as pungent and aromatic spice called ginger. The plant grown in many parts of the world including Jamaica, China, India and Africa. The ginger has many medicinal uses, fresh or dried rhizome is used in oral or topical preparations to treat a variety of ailments, while the essential oil is applied topically as an analgesic. Evidence suggests ginger is most effective against nausea and vomiting associated with surgery, vertigo, travel sickness and morning sickness. The *Zingiber officinale* contains 1-4% volatile oil, which has monoterpene hydrocarbons, oxygenated mono and sesquiterpenes (zingiberene, bisabolene, farnesene, sesquiphellandrene and curcumene) and phenolic ketones of oleo resin (shogaols, zingerone, paradols, gingidiols and hexahydrocurcumin) [1]. The aim of this review is to outline the studies that have reported pharmacological activity of *Zingiber officinale*, and to highlight further research aspects that may be necessary to incorporate ginger in modern medicine.

Anti-Inflammatory Activity

In Ayurveda ginger is reported to be useful in treating inflammation and rheumatism. Ginger exerts anti-inflammatory effects by inhibiting synthesis of inflammatory mediators such as prostaglandin and leukotriene [2, 3]. Essential oil of ginger exhibited anti-inflammatory effects against chronic adjuvant arthritis [4] and airway inflammation. *Zingiber officinale* ameliorates allergic asthma via suppression of Th2 mediated immune responses [5, 6, 7]. *Zingiber officinale* also relax airway smooth muscle and attenuate air way hyperresponsiveness in asthma [8].

Anti-Microbial Effect

The *Zingiber officinale* possess antibacterial action, the constituents of ginger inhibit the growth of colon bacteria like *Escherichia coli*, *Proteus species*, *Staphylococci*, *Streptococci* and *Salmonella* and antifungal action against [9, 10, 11]. The ginger and honey combination showed high inhibitory effect against *Salmonella typhi*, *Salmonella paratyphi A* and *Salmonella paratyphi B* [12]. Aqueous and ethanol extracts of black pepper and ginger mixed with sesame oil in a ratio 1:1:1 showed antibacterial activity against

Staphylococcus, *Enterobacter*, *Klebsiella*, *Salmonella*, *Serratia*, *Streptococcus*, *Escherichia coli* and *Micrococcus*. The antimicrobial action of ginger is proposed to mediate by mono and sequin terpenoids, which alter permeability of the cell membranes and producing bactericidal action [13].

Anti-Migraine Activity

The *Zingiber officinale* is reported in ayurvedic and Tibb system of medicine, it is regarded as abortive and prophylactic anti-migraine drug. It showed equivalent anti-migraine response and significant less numbers of adverse effects as compared to sumatriptan, in a clinical trial conducted in Iran [14].

Anti-Emetic Effects

The *Zingiber officinale* is considered as antiemetic in emesis of several origins, it has depicted effectiveness against motion sickness [15]. Ginger administration prior to elective gynaecologic laparoscopy was also found to be effective in preventing postoperative nausea and vomiting. The ginger administration 4 times daily over 4 days significantly reduced morning sickness in pregnant women [16].

Dyspepsia And Anti-Ulcer Activity

Zingiber officinale stimulate digestion, relieve constipation and flatulence by increasing muscular activity in the digestive tract [16]. Giner exhibited effectiveness against peptic ulcer diseases, gingerols showed antibacterial against *Helicobacter pylori*, the primary etiological factor associated with dyspepsia, peptic ulcer disease, development of gastric and colon cancer [17].

Cardiovascular Effects

The *Zingiber officinale* ginger is found effective in treatment of hypertension and palpitations. The crude extract of ginger induced a dose-dependent fall in the arterial blood pressure of anesthetized rats and guinea pigs [18-19]. The blood-pressure-lowering effect of ginger is purposed to mediate

through blockade of voltage-dependent calcium channels [20].

Anti- Cancer Activity

The *Zingiber officinale* extract inhibited growth and progression of PC-3 xenografts in nude mice. It disturbed cell-cycle progression, impaired reproductive capacity, modulated cell-cycle and apoptosis regulatory molecules and induced a caspase-driven, mitochondrially mediated apoptosis in human prostate cancer cells [21]. Ginger exhibit anti-neoplastic effects through the inhibition of NF- κ B, results in suppressed production of NF κ B regulated angiogenic factors and selectively inhibits ovarian cancer cell growth [22]. Purified ginger constituents such as 6, 8-, and 10-shogaols showed growth inhibitory effects in H-1299 human lung cancer cells and HCT-116 human colon cancer cells [23].

Dysmenorrhea

The *Zingiber officinale* reduce the severity and duration of pain in primary dysmenorrhea in students. The inhibit of cyclooxygenase and lipooxygenase pathways in prostaglandin and leukotriene synthesis has been proposed as mechanism of action [24].

Antioxidant Activity

The *Zingiber officinale* depicted antioxidant effect against DPPH (2, 2-diphenyl-1- picrylhydrazyl) free radical was measured. The phenolic content of plant could responsible for the antioxidant effects [25].

Anti-Diabetic Activity

Oral administration of aqueous ginger extract to streptozotocin (STZ)-induced diabetic rats for a period of 30 days showed a dose-dependent antihyperglycemic effect [26]. *Zingiber officinale* inhibits the activity of intestinal glucosidase and amylase, these effects could be responsible for the reduction of glucose absorption and blood glucose levels [27].

Anti-Hyperlipidemic Activity

In the cholesterol fed rabbits ethanolic extract of ginger causes marked reduction in serum and tissue cholesterol, serum triglyceride, serum lipo-protein and phospholipids [28].

Anti-Alzheimer Activity

6-Shogaol, an active constituent of Ginger, attenuates neuro-inflammation and cognitive deficits in animal models of dementia. Therefore, it could play an important role in the improvement of symptoms in patients who suffer from Alzheimer and other neurological diseases [29].

Nephroprotective Effect

Zingiber officinale depicted nephroprotective effect against kidney damage induced by metalaxyl, it reduces the level of serum malondialdehyde (lipid peroxidation marker) and increased the serum activity of antioxidant enzymes, SOD and CAT [30]. It also showed nephroprotective effect against gentamicin mediated nephropathy in rats. It improves kidney functions, reduces lipid peroxidation, and decreases nitrosative stress [31]. In addition; Ginger extract diminishes chronic fructose consumption-induced kidney injury by suppression of renal over expression of pro inflammatory cytokines in rats [32].

SUMMARY AND CONCLUSION

Zingiber officinale (family: Zingiberaceae) is well known ethnomedicine. The Ginger has many depicted anti-inflammatory, anti-microbial, anti-migraine, anti-emetic, anti-ulcer anti-cancer and anti-diabetic and nephroprotective effects in various animal models. There are enormous possibilities for using *Zingiber officinale* along with modern medicine for treatment various ailments.

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