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The study of the beneficial effects of ginger on human health: A critical review

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Abstract

Ginger appears to have been used as a spice and a medicine from early times by the Chinese and the Indians. It has been studied for its antibacterian, antifungal, pain-relieving anti-ulcer, antitumor and other properties). The rhizome of Ginger has long been used in Ayurvedic and traditional Chinese medicine to treat a wide range of ailments including gastrointestinal disorders, mainly nausea and vomiting associated with motion sickness. It has been recommended by herbalists for use as a carminative, diaphoretic, expectorant and astringent. Like many medicinal herbs, much of the information has been handed down by word of mouth with little controlled scientific evidence to support the numerous claims. However, in the last few years, more organized scientific investigation have focused on the mechanism and targets of ginger and its various components. Ginger (*Z. Officinal's* Roscoc, *Zingibera ceae*) is not only widely used as a dietary condiment but it has also been extensively utilized as a traditional medicine. Ginger's anti inflammatory properties help relieve pain and reduce inflammation associated with arthritis rheumatism and muscle spasm. Ginger also has been found to increase gastric-juice secretion and the production of hydrochloride. It mean that food is digested more quickly, creating an unfriendly environment for bacteria.

Keywords: Gastro intestinal, spice, medicine, ailments, inflammatory

Introductions

Ginger root was first cultivated in Asia and has been used as a medicinal herb for at least 2000 years ago [1] Ginger is a natural dietary component which has antioxidant and anticarcinogenic properties [2] Fluid extracts of ginger have been used since the 1500s for the treatment of GI distress. In China, ginger root and stem are used as pesticides against aphids and fungal spores [3] The taste of Ginger being aromatic and pleasntry pungent, it finds wide employment as a spice in the preparation of dishes of a most diverce character varying from curries to ginger bread. By virtue of its action as a carminative and stimulant to the gastro-intestinal tract, ginger plays a very useful part in pharmacy. Ginger Oleoresins is obtained by solvent extraction of dried ginger and is prepared both in certain industrialized western countries and in some of the spice producing countries, most notably in Australia. The ginger oil prepared from fresh ginger rhizomes was determined by gas chromatography (GC) and GC-MS techniques. The main sesquiterpene hydrocarbons identified were α -zingiberene (27.30%) α -curcumene (8-9%), β -sesqui phellandrene (4.8%) nd birsabolene (3.2%) [4].

Botany

Medicinal species: *Zingiber officinale* common names: Ginger, African ginger, Black ginger, Cochin ginger, Ganjiang, Gegibre, Ingwer, Jamaican ginger.

Botanical family: Zingiberaceae Ginger is closely related to two other cooking spices, turmeric and cardamons.

Plant description: Ginger is a herbaceous perennial leafy shoots, which attain a height of about 1 to 3 ft. After the flowers have disappeared and the stems have withered, ginger is ripe for collection. The rhizomes is aromatic and the source of the dried powered spice.

General composition of the ginger rhizome

Ginger contains from 0.25 to 3 percent of a volatile oil of light yellow colours having a characteristic odour. Jamaican variety yields about 1 percent, African from 2 to 3 percent and the Indian about 3.5 percent [5].

A typical analysis of a market sample of green ginger gave the following values moisture, 80.9; protein, 2.3; fat, 0.9; carbohydrates, 12.3; fibre 2.4; and minerals, 1.2. (as percentages). The principal minerals and vitamins in mg/100g are ca, 20; p, 60; and fe, 2.6; the vitamins, thiamine, 0.06; riboflavin, 0.03; niacin, 0.6 and ascorbic acid, 6.0. About 18.6% protein remains unextracted, the

extracted proteins contain 35.6% albumin, 16.9%; globulin, 11.0%; prolamine and 17.9% glutelin, on total proteins [6]. Commercial dried ginger has been reported to provide oleoresins in yields of 3.5 – 10% and to contain 15–30% of volatile oil (Govindarajan 1982) Table 1. Gives the composition of ginger, spent ginger and by products in commercial ginger samples.

Table 1: Composition of ginger, spent ginger, and by-products (commercial samples).

	Moisture	NVEE	VEE	Fibre	Ash			Crude starch	Protein			Alcohol extract	Cold water extract
					Total	Sand	Lime		Nx6.25	NVEE	VEE		
Jamaican													
Natural	11.20	3.91	1.79	3.72	4.17	0.22	0.28	57.59	7.85	7.30	3.23	4.95	15.54
Limed	10.56	3.12	1.27	2.37	8.31	0.02	2.72	57.31	9.34	--	--	--	--
Cochin													
Rough	10.43	3.70	2.09	3.62	3.86	0.10	0.48	59.08	8.15	6.68	7.03	6.32	14.30
Scraped, limed	9.97	2.95	1.49	2.60	5.38	0.08	1.29	62.42	7.50	--	--	--	--
Callcut	--	--	--	--	--	--	--	--	--	6.42	4.62	7.64	13.08
African	9.97	5.35	2.73	4.66	4.00	0.11	0.25	56.74	7.92	8.49	7.17	6.36	12.62
Japanese	10.30	3.94	0.96	2.73	6.19	0.71	1.666	0.55	5.40	7.01	7.39	8.37	14.40
Washes													
Scraggy	4.99	9.55	6.05	13.18	8.05	0.89	0.61	31.38	7.00	--	--	--	--
Cuttings	3.19	2.76	7.06	8.69	9.20	1.81	1.06	40.23	8.69	--	--	--	--
Residue (ginger after manufacture)	10.61	3.86	1.61	5.17	2.12	0.18	--	59.86	6.94	--	--	--	--
Residue (extract)	8.02	0.54	0.13	--	5.05	1.50	--	--	--	--	--	--	--

Note: NVEE-non-volatile other extract; VEE-volatile other extract.

Medicinal and pharmacological properties

Anticancer properties

Ginger, a natural dietary component, has been known to have antioxidant and anti carcinogenic properties. A study conducted by Abdullah, provided evidence that ginger acts as a potent growth inhibitory compound in human colon adenocarcinoma cells and the study supports the possibility of chemopreventive potential of ginger in colon cancer cells. The cytotoxic effect could be as a result of the active component. Azoxy methane induced intestinal carcinogenesis in rats was significantly suppressed by dietary administration of gingerol [7].

It is evidence that the anti tumour effects on colon cancer cells were exerted by ginger by suppressing their growth, arresting the G0/G1-Phase, reducing DNA synthesis and inducing apoptosis [8].

Anti-inflammatory effect

Oral dried ginger or ginger extract (solvent 80% ethanol) or (6) shogaol reduced carrageenan induced paw swelling paw edema induced by compound 48/80 or serotonin was also significantly inhibited by intraperitoneal administration of a hydroalcoholic extract [9-10].

Ginger oil given orally for 26 days caused a significant suppression of paw and joint swellings in rats treated with Mycobacterium tuberculosis to induce severe arthritis in the knee and paw [11].

Platelet aggregation

Ten studies were included, comprising eight clinical trials and two observational studies. Of the eight clinical trials, four reported that ginger reduced platelet aggregation, while the remaining four reported no effect. The two observational studies also reported mixed findings [12].

Antioxidant effect: Ginger and some specific constituents have demonstrated antioxidant effects in cell culture system.

Gingers extract inhibited hydroxyl radicals by 79.6% at 37 °C and 74.8% at 80 °C which showed a higher antioxidant activity than quercetin [13].

In rats ginger extract also ameliorated acetic acid – induced ulcerative colitis, likely due to antioxidant actions [14].

Gastrointestinal effects

The antiemetic effect of acetone and hydroalcoholic ginger extracts and their antiemetic constituents (shogaols, gingerols) experimented on four animals, one study shows reversal of the inhibitory effect of cisplatin on gastric emptying in rats by ginger acetone or ethanol extracts. 15-16 Another anticancer compound in [6] ginger ulfonic acid with weaker pungency but more potent antiulcer activity than [6] gingerol and [6] Shogaol [17].

Antimicrobial activity

Ginger has strong antibacterial in addition to some antifungal properties. It has been reported *in vitro* studies to suppress the growth of a variety of common infections bacteria including *staphylococcus aureus* and *listena monocytogenes* [18]. It is found in animal studies ginger extracts exhibited the capacity to protect mice against infections [19].

Osteoarthritic pain

Several animal studies show evidence that ginger and its active ingredients have the capacity to decrease symptoms of inflammation associated conditions such as arthritis [20, 21]. But further studies are necessary to prove the efficacy of ginger preparation in the treatment of osteoarthritic pain.

Cardiovascular effect

Ginger reduced the blood pressure and decreased cardiac workload and thromboxane thus lowering the clotting ability of the blood [22]. One study reported that potential of different extracts (ethanolic, hexane and aqueous) of ginger

and the essential oil in 5-HT³ receptor antagonistic effects [6]. Gingerol showed maximum potential [23].

Nausea and vomiting during pregnancy

A few studies demonstrated that 0.5 or 1g of ginger powder or an extract (solvent not stated) may be effective in treating nausea and/or emesis during pregnancy. Preliminary studies suggest that ginger may be effective for mild to moderate nausea and vomiting of pregnancy, when used at a recommended dose of 1-g dried ginger per day [24-25]. The quality and integrity of ginger preparations manufactured for use by women during pregnancy to be carefully determined.

Regulation of blood glucose and lipid levels

Ginger is used to decrease cholesterol and triglyceride level. The ginger constituent zingiberone also produced lower blood glucose levels, body weight, in ovariectomized rats. [26] But one human study, in which ginger powder was administered in 4-g daily doses for 3 months to patients with coronary artery disease did not show any change in either blood glucose or blood lipid levels [27].

Numerous properties in treating CINV

Ginger demonstrates numerous properties that may be beneficial in treating chemotherapy induced nausea, retching and vomiting (CINV) including reversing the inhibitory effect of cisplatin on gastric emptying in rats [28-29]. There are multiple results the effect of Ginger or CINV. One study showing no effect [30], another with mixed results [31], and two other with positive outcomes [32-33].

Toxicology

There are no reports of severe toxicity in human from the ingestion of ginger root. A comprehensive review of human trials concluded that ginger at doses up to 2 g/d resulted in minimum toxicity for human. [34] Although progress in determining the active components and metabolites of ginger and understanding their pharmacokinetics has been made, more work is clearly needed.

Discussion

Ginger is one of the most commonly consumed dietary condiments in the world (Surh *et al.* 1999). Although ginger is generally considered to be safe (Kaul and Joshi 2001), the lack of a complete understanding of its mechanisms of action suggests caution in its therapeutic use (Wilkinson 2000a). The medicinal, chemical, and pharmacological properties of ginger have been extensively reviewed. (Surh, Lee, and Lee 1998; Ernst and Pittle) 2000; Afzal *et al.* 2001; and Roufogalis 2005; Eliopoulos 2007; White 2007; Nicoll and Henlin 2009). Ginger has been used for thousands of years for the treatment of hundreds of ailments from colds to cancer. The potential of ginger in the culinary, non-culinary and medicinal field is based on the chemistry of volatile oil and non-volatile pungent principles. The main compounds are zingiberene (29.5%) and sesquiphellandrene (18.4%). Ginger has proven anti-inflammatory, antioxidant and antiulcer principles [35].

Conclusion

The review article is based on current and past research done on the powerful therapeutic effect of ginger for the various indications.

Ginger is considered to be a safe herbal medicine, Herbal medicine is still the mainstay of about 75-80% of the world population, mainly in developing countries because of better culture acceptability, better compatibility with the human body and lesser side effects. Although the medicinal properties of ginger have been known for thousands of years. Therefore more extensive and well controlled human studies are sought before approving its use as a supplement for treatment of the diseases in order to give ginger a deserving place.

Conflict of Interests: The author declares that there is no conflict of interest.

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