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 antibacterial, 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.

Botany


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

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 gingeres have 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 singer and by products in commercials ginger samples.

| Table 1: Composition of ginger, spent ginger, and by-products (commercial samples). |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Ash                                   | Protein         |
| Crude starch                          | Crude starch    |
| Sand                                  | Lime            |
| Crude starch                          | Crude starch    |
| VEE                                   | VEE             |
| Alcohol extract                       | Cold water extract |
| Moisture (g)                          | Moisture (g)    | Moisture (g)    | Moisture (g)    | Moisture (g)    | Moisture (g)    | Moisture (g)    | Moisture (g)    | Moisture (g)    |
| 3.91                                  | 3.12            | 3.70            | 3.62            | 1.59            | 3.68            | 2.37            | 2.37            | 2.76            |
| 3.72                                  | 2.37            | 2.09            | 3.66            | 1.49            | 2.73            | 4.66            | 3.49            | 2.17            |
| 1.79                                  | 1.27            | 2.09            | 1.90            | 0.11            | 1.91            | 1.73            | 1.90            | 1.01            |
| 4.17                                  | 4.00            | 3.86            | 0.10            | 0.25            | 0.17            | 7.04            | 7.94            | 0.71            |
| 0.22                                  | 0.11            | 0.80            | 0.08            | 0.08            | 0.08            | 7.51            | 5.44            | 0.70            |
| 0.28                                  | 0.25            | 0.48            | 0.19            | 0.13            | 0.17            | 1.57            | 1.66            | 0.70            |
| 57.59                                 | 56.74           | 59.08           | 57.31           | 56.54           | 59.08           | 57.31           | 60.43           | 57.01           |
| 7.85                                  | 7.92            | 8.15            | 9.34            | 7.49            | 9.15            | 8.15            | 7.92            | 7.39            |
| 7.30                                  | 8.49            | 6.68            | 9.34            | 7.17            | 7.92            | 7.49            | 8.15            | 8.37            |
| 3.23                                  | 3.40            | 6.32            | 4.95            | 6.36            | 7.64            | 6.42            | 7.03            | 6.32            |
| 15.54                                 | 12.62           | 13.08           | 14.30           | 14.40           |

Note: VEE-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 carcogenic 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 anit 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 swelling in rates 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


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 monocy to genes [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
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 thousand 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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