

The Chemical Composition of the Ginger Plant

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ABSTRACT

Zingiber has been found to secrete medicinal substances with different activities in the officinale plant. Chemical components, mainly consisting of monoterpene and sesquiterpene hydrocarbons such as α -zingiberene, ar-curcumene, β -bisabolene and β -sesquiphellandrene.

KEYWORDS: *Zingiber officinale*, gingerol and paradol, shogaols, zingerone, and galanals A and B..

Plants of the genus *Zingiber* (Family Zingiberaceae) are widely used throughout the world as food and medicinal plants. They represent very popular herbal remedies in various traditional healing systems; in particular, rhizome of *Zingiber* spp. plants has a long history of ethnobotanical uses because of a plethora of curative properties. Antimicrobial activity of rhizome essential oil has been extensively confirmed in vitro and attributed to its chemical components, mainly consisting of monoterpene and sesquiterpene hydrocarbons such as α -zingiberene, ar-curcumene, β -bisabolene and β -sesquiphellandrene. In addition, gingerols have been identified as the major active components in the fresh rhizome, whereas shogaols, dehydrated gingerol derivatives, are the predominant pungent constituents in dried rhizome. *Zingiber* spp. may thus represent a promising and innovative source of natural alternatives to chemical food preservatives. This approach would meet the increasing concern of consumers aware of the potential health risks associated with the conventional antimicrobial agents in food. This narrative review aims at providing a literature overview on *Zingiber* spp. plants, their cultivation, traditional uses, phytochemical constituents and biological activities.

Today's consumers are becoming more aware of the link between diet and health. For instance, the Mediterranean diet possesses a plethora of bioactive phytochemicals, e.g., polyphenols and melatonin, which can contribute to its beneficial effects against chronic-degenerative disorders, including cancer, cardiovascular diseases and diabetes. This trend is leading to increasing demand for the use of natural ingredients as food supplements and preservatives. In addition, an increasing number of microorganisms that are not only antibiotic resistant, but are more tolerant to existing preservative techniques is of worldwide concern. Plant derived extracts that have biological activities, such as antimicrobial, antidiabetic or antihypertensive effects, have the potential to fulfill the need for safe natural preservatives. Therefore, much emphasis has been put on the investigation of plant derived natural sources of antimicrobials, compounds that could potentially replace chemical preservatives and synthetic antimicrobial ingredients.

Herbs and spices, which are an important part of the human diet, have been used for thousands of years to enhance the flavor, color and aroma of food. In addition to boosting flavor, herbs and spices are also known for their preservative, antioxidant, antimicrobial and other medicinal properties. The genus *Zingiber*, belonging to the family Zingiberaceae, comprises about 85 species of herbs mostly grown in Asia, Central, South America and Africa. Although different members of this genus are somewhat similar in morphology, they differ widely in their pharmacological and therapeutic

properties.

The most popular spice, ginger, comes from the underground stems or rhizomes of the plant *Zingiber officinale* Roscoe. It has been widely reported in literature that ginger is consumed worldwide as a spice and flavoring agent and is attributed to having many medicinal properties

The essential oil (EO) from *Zingiber* rhizome is pale yellow to light-amber, contains both aromatic and pungent compounds and can be extracted with yields ranging from 1.5–3.0%, depending on the quality of the crop.

Phytochemical investigation of the rhizomes of several *Zingiber* spp. has revealed the presence of bioactive compounds such as gingerols, shogaols, diarylheptanoids, phenylbutenoids, flavanoids, diterpenoids and sesquiterpenoids. The gingerols are identified as the major active components in the fresh rhizome of the plant. In addition, shogaols, dehydrated gingerol derivatives, are the predominant pungent constituents in dried ginger.

Zingiber plants possess various pharmacological and physiological effects and are common ingredients in traditional medicines. The rhizomes have been shown to be effective in the treatment of several medical conditions including stomach problems, nausea, vomiting, epilepsy, sore throat, cough, common cold, bruises, wounds, liver complaints, rheumatism, muscular pains, atherosclerosis, migraine headaches, high cholesterol, ulcers, and stomach discomfort. In addition, phenolic compounds, especially the gingerols, in ginger root have been shown to have chemopreventive effects that have been associated with their antioxidant and anti-inflammatory activities.

The EOs of *Zingiber* rhizomes are used for preserving various foods against autoxidation and microbial spoilage because of their antioxidant and antimicrobial properties. Many in vitro studies demonstrated the antimicrobial potential of *Zingiber* plant extracts against both Gram-positive (*Bacillus cereus*, *Staphylococcus aureus*) and Gram-negative (*Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia*) bacteria. The EOs also exhibited significant antifungal activity against *Candida glabrata*, *C. albicans* and *Aspergillus niger*. These results suggest that EO of *Zingiber* plant could be used in the treatment of many bacterial and fungal diseases as well as in food preservation as natural preservatives. The main aim of this paper is to provide an overview of the biological activity of the *Zingiber* spp. EOs and their components focus on the potential application of *Zingiber* plants as natural preservatives for foods.

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