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A REVIEW ON SAUNTHI (ZINGIBER OFFICINALE ROSC.): AN OVERVIEW

Premlata[1*] and B. Ram[2]

[1*]Senior Resident, Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India 221005.

[2]Professor, Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India 221005.

***Corresponding Author: Premlata**

Senior Resident, Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India 221005.

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ABSTRACT

Spice and medicinal plants, including ginger, have gained importance due to their: Increasing demand: For pharmaceutical and everyday uses and Economic value: Contributing to agronomy production, pharmacy, and exportation. A Versatile Medicinal Plant (Zingiber officinale) has been used for over 2,000 years, offering: Medicinal properties: Due to compounds like gingerol, paradol, and shogaols and Culinary uses: As a condiment in various foods and beverages. Recent scientific investigations focus on: Isolation and identification: Of active constituents and Pharmacological actions: Verifying ginger's effectiveness in treating various diseases and conditions. This article reviews the latest reports on Ethnobotany: Traditional uses and cultural significance, Pharmacology: Ginger's therapeutic properties and applications, Phytochemistry: Chemical composition and active compounds and Biological activities: Ginger's effects on human health and diseases.

KEYWORDS: Verifying ginger's effectiveness in treating various diseases and conditions.

1. INTRODUCTION

A Treasure Trove of Medicinal Agents For millennia, nature has been a rich source of medicinal agents, yielding a significant number of modern drugs that have revolutionized disease treatment.[1] Traditional knowledge of medicinal plants has long been a driving force in the quest for new treatments. These plants offer numerous advantages: - Affordability: Often cheaper than modern medicines, Accessibility: Locally available, reducing reliance on external sources and Ease of use: Can be consumed raw or as simple medicinal preparations. The effectiveness of these traditional remedies lies in their active chemical constituents, which elicit beneficial responses in the body.[2] Medicinal plants are aptly termed "Chemical Goldmines" due to their rich content of natural chemicals, which are: Biocompatible: Acceptable to human and animal systems and Irreplaceable: Many plant chemicals cannot be replicated in laboratories. These plants produce secondary metabolites, many of which are: Commercially valuable: Used in various pharmaceutical compounds and Medicinally significant: Essential for human healthcare.[3] Ginger, scientifically known as Zingiber officinale Roscoe (Family: Zingiberaceae), is a highly valued plant with numerous: Medicinal properties, Nutritional benefits, Ethnomedical uses Due to its versatility, ginger is extensively used worldwide as: Spice, Flavouring agent and Herbal formulations. Zingiber officinale has been employed in traditional medicinal system to treat a range of health issues due to its medicinal properties like: Anti-inflammatory, Hypolipidemic, Antiatherosclerotic, Antiemetic, Antiulcer, Antiplatelet, Antipyretic, Cardiotonic, Antioxidant, Antibacterial, Antifungal, Antitumoural, Molluscicidal, Antischistosomal, Carbonyl reductase activity, Cholagogic (promotes discharge of bile from the system and purging it downwards), Antiserotoninergic, Antirhinoviral, Hypouricemic, Analgesic, Antidepressant, Hepatoprotective, Hypoglycemic, Inotropic, inhibition of prostaglandin release (dose dependent).[4]

2. MATERIAL AND METHODS

A thorough literature review was conducted to gather information on Saunthi and Zingiber officinale. The review covered: Traditional Sources like Original Ayurvedic scriptures, Classical Ayurvedic texts, Indian Ayurvedic Pharmacopoeia and Scientific Databases like Science Direct, PubMed and Google Scholar.

3. BOTANICAL DESCRIPTION OF SAUNTHI

The Zingiberaceae family comprises: 46 genera and distributed across tropical and subtropical regions. The

family belongs to genus Zingiber. The taxonomical position of Zingiber is as follows.[5]

Table No. 1: Scientific Classification of Zingiber Officinale.

Kingdom	**Plantae**
Division	Magnoliophyta
Class	Liliopsida
Order	Zingiberals
Family	Zingiberaceae
Genus	Zingiber
Species	Z. officinale

Saunthi (Zingiber officinale) is herbaceous rhizomatous perennial, reaching up to 90 cm in height under cultivation. Rhizomes are aromatic, thick lobed, pale yellowish, bearing simple alternate distichous narrow oblong lanceolate leaves. The herb develops several lateral shoots in clumps, which begin to dry when the plant matures. Leaves are long and 2 - 3 cm broad with sheathing bases, the blade gradually tapering to a point. Inflorescence solitary, lateral radical pedunculate oblongcylindrical spikes. Flowers are rare, rather small, calyx superior, gamosepalous, three toothed, open splitting on one side, corolla of three subequal oblong to lanceolate connate greenish segments.[6]

4. RASA PANCHAKA OF SAUNTHI (ZINGIBER OFFICINALE)[7]

Rasa - KaÔu
Guna - Laghu, Snigdha.
Virya - UÒhna
VipÁka - Madhura
Doshakarma - Kaphavatahara
Rogaghnata - Aamavata, Vami, Shvasa, kasa, Slipada, Shotha, Arsha, Anaha, Udara maruta, Vibandha.
Karma –VéiÒya, Svarya, Rucya, Grahi, Vibandha Bhedini.
Part used -Dried rhizome
Dose - 1-2 g of the drug in powder form, 0.3-0.6 ml Zinger tincture, 2-4 ml Zinger syrup

4.1. Guna of Saunthi in Different Nighantu

	D.N.[8]	**S.N.**[9]	**M.N.**[10]	**R.N.**[11]	**K.N.**[12]	**B.P.N.**[13]
Rasa	Katu		Katu	Katu	Katu	Katu,
Guna	Snigdha	Snigdha, Laghu	Laghu, Snigdha	Snigdha	Snigdha, Laghu	Laghu, Snigdha
Virya	UÒna	UÒna	UÒÆa	UÒÆa	UÒna	UÒna
Vipaka	-	Madhura	Madhura	-	Madhura	Madhura
Dosaghnata	Kaphahara	Kapha Vatahara	Kapha Vatanut	Kapha Anilapaha	Vatakaphahara	Kapha Vatanut

5. DESCRIPTION OF SAUNTHI IN THE AYURVEDIC PHARMACOPOEIA OF INDIA[14]

Zingiber officinale is included as a monograph in The Ayurvedic Pharmacopoeia of India in Part-I & Volume I and mentioned along with its definition, synonyms, macroscopic and microscopic description, identity, purity and strength, assay, constituents, properties and actions, important formulations, therapeutic uses and dose.

5.1. Purity and Strength

Foreign matter should not be more than 1%. Total ash value should not exceed more than 6% whereas acid-soluble ash should not exceed more than 1.5%.

5.2. Active Constituents

Essential oil, pungent constituents (gingerol and shogaol), resinous matter and starch.

6. PHARMACOLOGICAL ACTIONS AND SCIENTIFIC EVIDENCE OF GOKSHURA

A comprehensive review of Saunthi's pharmacological actions reveals the following biochemical and pharmacological activities.

6.1. Anti inflammatory activity

Inflammation is a host defence mechanism of the body and it's an essential immune response that enables the body to survival during infection or injury and maintains tissue homeostasis in noxious conditions. Inflammation is a localized protective reaction of cells tissues of the body to allergic or chemical irritation, injury or infections. Recent study documented the ability of a hexane fraction of dried ginger methanolic extract to suppress proinflammatory gene expression in LPS-activated BV2 microglial cells, thus displaying anti-neuroinflammatory activity.[15] Gingerol and structurally related pungent principles of ginger including shogaol exert inhibitory effects on biosynthesis of prostaglandins and leukotrienes through suppression of prostaglandin synthase or 5-lipoxygenase.[16, 17]

6.2. Anti Oxidant Activity

Antioxidants are compounds or systems that can safely interact with free radicals and terminate the chain reaction before vital molecules are damaged. They can use several mechanisms: (i) scavenging species that initiate peroxidation, (ii) chelating metal ions so that they are unable to generate reactive species or decompose peroxides, (iii) quenching *O2 − preventing formation of peroxides, (iv) breaking the auto oxidative chain reaction, and/or (v) reducing localized O2 concentrations.[18] Ginger can be regarded as the storehouse of antioxidants. It has an extraordinary property of scavenging reactive oxygen species (ROS), free radicals, peroxides, and various other damaging oxidants. The active ingredients like gingerols, shogaols, zingerone, and so forth present in ginger exhibit antioxidant activity. It inhibits an enzyme, namely, xanthine oxidase, which ismainly involved in the generation of reactive oxygen species. Zingerone has

been reported to protect in vitro DNA against stannous chloride induced ROS oxidative damage.[19] Zingerone provides direct adaptogenic effect by preventing oxidative stress on smooth muscles of intestine.[20] Eleazu and Eleazu (2012) studied antioxidant potentials of six varieties of ginger.[21]

6.3. Antimicrobial activity

Food borne illnesses are a major concern for consumers, the food industry, and food safety authorities. In recent years, considerable effort has been made to find natural antimicrobials that can inhibit bacterial and fungal growth in foods in order to improve quality and shelf-life. Natural extracts of plants have been used for many years for different purposes and recently they have been screened for their potential use as alternative remedies and food preservatives.[22] The antibacterial activities of plant extracts and oils can be useful for the preservation of raw and processed food, in the pharmaceutical industry and as alternative medicines and natural therapies.[23] The essential oil from ginger, was studied for antimicrobial activity against Aspergillus niger, Saccharomyces cerevisiae, Mycoderma sp., Lactobacillus acidophilus and Bacillus cereus, as determined by paper agar diffusion method.[24]

6.4. Anti-diabeticactivity

Diabetes is a metabolic disorder and major global health problem worldwide. It is caused by abnormality of carbohydrate metabolism which is related to low blood insulin level or insensitivity of target organs to insulin.[25] Untreated cases show severe tissue and vascular damage leading to serious complications such as retinopathy, neuropathy, nephropathy, cardiovascular complications and ulceration. An important finding based on in STZ treated-type 1 diabetic rat model reported that, oral administration of ethanolic extract of ginger significantly decrease fasting blood glucose level.[26] Earlier study reported that significant blood glucose lowering effect of ginger juice in diabetic and nondiabetic animals.[27] The growth of osteoblastic MC3T3-E1 cells was increased in the presence of 0.1 lM 6-GN and 30 mM 2-deoxy-D-ribose, as a result of elevating the alkaline phosphatase activity, collagen content and osteocalcin secretion of the cells. At concentrations of 1 and 100 nM, 6- GN increased the osteoprotegerin secretion in osteoblastic cells and decreased the protein carbonyl contents of osteoblastic cells, which is of importance in bone diseases related to diabetes.[28] The antidiabetic activity of fresh juice of Z. officinale was proposed to be correlated through 5-HT receptor antagonism. Since 6-gingerol the chemical and biological marker substance present in Z. officinale is reported to possess 5-HT antagonistic activity the present investigation was undertaken to study the effect of methanolic extract and its fractions in STZ-induced NIDDM rats and to correlate with concentrations of 6-gingerol present therein.[29]

6.5. Analgesic activity

[6]-shogaol has also been shown to inhibit acetic acid-induced writhing in mice and to elevate the nociceptive threshold of the yeast-inflamed paw.[30] Experiments carried out by Onogi and co-workers suggested that [6]-shogaol inhibits the release of Substance P by stimulation of the primary afferents from their central terminal and hence shares this site of action with capsaicin.[31]

6.6. Antipyretic activity

A Soxhlet extract of ginger in 80% ethanol reduced yeastinduced fever in rats by 38% when administered orally (100 mg/kg).[32] This was comparable to the antipyretic effect of acetylsalicylic acid at the same dose. The ginger extract did not affect the temperature of normothermic rats. This antipyretic activity may be mediated by COX inhibition.

6.7. Immunomodulatory activity

The beneficial effects of ginger in treating coughs, colds and flu is probably linked to immune-boosting properties of the plant.[33] Few studies have examined the potential immunomodulatory activity of ginger. Non-specific immunity was increased in rainbow trout eating a diet containing 1% of a dried aqueous ginger extract for three weeks.[34] Mice fed a 50% ethanolic ginger extract (25 mg/kg) for seven days had higher haemagglutinating antibody titre and plaque-forming cell counts, consistent with improved humoral immunity.[35] One in vitro study found that ginger suppressed lymphocyte proliferation; this was mediated by decreases in IL-2 and IL10 production.[36]

6.8. Anti-atherosclerotic activity

In a more recent study, air-dried ginger powder (100 mg/kg orally daily) fed to rabbits with experimentally induced atherosclerosis for 75 days inhibited atherosclerotic changes in the aorta and coronary arteries by about 50%.[37] In this study the ginger treatment did not cause any significant lowering of serum lipids, but lipid peroxidation was decreased and fibrinolytic activity increased.

6.9. Anti-platelet aggregation activity

Significant anti-platelet aggregation activity was displayed by 6-GN and 6-SG, while 10-GN inhibited Ca2+-dependent contractions in media high in K+.[38] The aggregation and release reaction of arachidonic acid and collagen-induced rabbit platelets were inhibited by 6-GN at 0.5–20 lM. It also inhibited thromboxane B2 and PG D2 formation, caused by arachidonic acid, at 0.5–10 lM 6-GN.[39]

6.10. Anti-angiogenic activity

Kim et al., 2005 has performed that [6]-Gingerol has anti-tumor-promoting activities. They reported its novel anti-angiogenic activity in vitro and in vivo. In vitro, [6]-gingerol inhibited both the VEGF- and bFGFinduced

proliferation of human endothelial cells and caused cell cycle arrest in the G1 phase.[40]

6.11. Hepato -protective activity

Earlier investigators based on experimental findings have shown that, ginger and its con stituents play a significant role in hepato-protection. An important study on ginger showed its protective effect against the CCl4-induced hepatotoxicity.[41]

6.12. Anti-emetic activity

Ginger is the herb most commonly used to treat nausea and vomiting in pregnancy, either recommended by providers or used as self-treatment by women.[42] It would be even more effective than vitamin B6 for relieving the severity of nausea and is equally effective for decreasing the number of vomiting episodes in early pregnancy.[43] Studies based on animal model revealed that, ginger extract possesses anti serotoninergic and 5-HT3 receptor antagonism effects which play an important role in the etiology of postoperative nausea and vomiting.[44, 45, 46]

6.13. Neuroprotective activity

Ginger and their constituents play a vital role as neuroprotector. The exact mechanism of action of ginger in this vista is not known fully. But it is thought ginger shows neuroprotector effect due to the phenolic and flavonoids compounds. An important study has shown that, 6-shogaol has neuroprotective effects in transient global ischemia via the inhibition of microglia.[47] Another finding in the support of ginger as neuroprotector suggests that, it exhibit neuroprotective effect by accelerating brain anti-oxidant defense mechanisms and down regulating the MDA levels to the normal levels in the diabetic rats.[48] A recent report on ginger juice showed that, ginger has protective effect by decreasing the LPO and increasing GSH, SOD, CAT, GPx, GST, GR and QR and protein level in treated rats.[49]

6.14. Anthelmintic activity Aqueous extracts of rhizome of Z. officinale was investigated for their anti-helmintic activity against the earthworm Pheretima posthuma. The result reveled that the test extract (100mg/ml) possess significant anthelmintic activity [50]. Methanol extracts of Z. officinale was screened for their in vitro anthelmintic activity. Results revealed that Zingiber officinale killed all the test worms (Haemonchus contortus) within two hours post exposure being 100% effective.[51]

6.15. Gastroprotectiveactivity

Peptic ulcer is a major problem worldwide in both sexes. Various factors including food ingredients, stress, Helicobacter pylori and drugs are responsible of gastric ulcer. Several medicinal plants and its constituents show anti-ulcer effect in various ways but the exact mechanism is not understood fully. Ginger and its constituents show a vital role in ulcer prevention via increasing mucin secretion. Earlier findings have shown anti-ulcerative effects of ginger in experimental gastric ulcer models.[52]

6.16. Cardiovascular activity

Including in Ayurvedic science, ginger has been described as great heart tonic. It helps in preventing various heart diseases by reducing blood clotting that can lead to plaque formation or thrombosis. It can also open the blockage in the blood vessels thus decreasing peripheral vascular resistance and hence blood pressure. Ginger also may help to lower high cholesterol making the heart healthy.[53] Ginger extracts as well as [6]-and [8]-gingerol have been shown to modulate eicosanoid responses in smooth vascular muscles ex vivo.[54, 55, 56] An early study found a dose-dependent positive inotropic action of [6]-, [8]- and [10]- gingerol on isolated guinea pig left atria, and ‘gingerol’ stimulated the Ca2+-pumping ATPase activity of fragmented sarcoplasmic reticulum prepared from mammalian skeletal and cardiac muscle.[57] In a recent study a crude extract (70% aqueous methanol) of fresh ginger induced a dose dependent fall in arterial blood pressure of anaesthetised rats; this effect was shown to be mediated through blockade of voltage-dependent calcium channels.[58]

7. DISCUSSION AND CONCLUSION

Zingiber officinale is a widely used dietary condiment and medicinal herb with a history spanning thousands of years. It has been employed to treat various ailments, and its bioactive components have been extensively studied. Chemical and metabolic analyses have revealed that Zingiber officinale contains many compounds and metabolites. The most notable bioactive components include: Gingerols, Shogaols, 6-Gingerol, 6-Shogaol. The content of these components varies depending on the source and preparation of the ginger rhizome. In recent years, research interest in natural compounds, including ginger, has increased. However, many studies provide descriptive and observational data rather than mechanistic insights. Further research is necessary to investigate the kinetics of ginger and its constituents in animals and humans, examine the effects of long-term consumption, Identify specific molecular targets and mechanisms of action. Standardization and Safety Concerns like the lack of standardization in ginger supplements is a concern. Additionally, the safety of consuming high levels of isolated components, such as 6-gingerol, is uncertain. It is possible that 6-gingerol and other ginger components require inter-reactivity or dependency on other components in the whole food source to exert their positive effects. Zingiber officinale therapeutic properties are supported by research: Antioxidant, Anti-Inflammatory, Immunomodulatory, Antimicrobial, Antidiabetic, Analgesic, Antipyretic etc. Zingiber officinale demonstrates: Potent antioxidant activity: In laboratory experiments (in vitro) and tissue samples (ex vivo). And anti-inflammatory properties: By suppressing COX-2, inhibiting prostaglandin and leukotriene production, and reducing inflammation.

Areas for further research to fully understand Zingiber officinale benefits, more research is needed: In vivo studies: To confirm antioxidant effects in living organisms. Specific targets and mechanisms: To elucidate the exact ways ginger exerts its therapeutic effects.

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