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RESEARCH ARTICLE

Pharmacognostical and Phytochemical Screening of GC–MS Analysis of Bioactive Compounds Present in Ethanolic Rhizome Extract of *Zingiber officinale* Roscoe

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ABSTRACT

Nowadays, nanotechnology is used as a way to increase bioavailability and decrease the side effects of drugs and nutrients. Micronutrients and nutraceuticals such as vitamins, carotenoids, polyunsaturated fatty acids and polyphenols are classes of food ingredients that are essential for human health and well-being. These compounds are rarely added purely to the targeted food application but rather in encapsulated, solid, dry product forms with added functionalities such as improved stability, bioavailability or handling. Development of new strategies, like nanocarriers, that help to promote the access of neuroprotective molecules to the brain, is needed for providing more effective therapies for the disorders of the Central Nervous System (CNS). Polymer–lipid hybrid nanoparticles, encapsulating vitamin D3 and vitamin K2, with improved features in terms of stability, loading and mucoadhesiveness were produced for potential nutraceutical and pharmaceutical applications. Recently, nanoformulations that include nanovesicles, solid-lipid nanoparticles, nanostructured lipid carriers, nanoemulsions, and polymeric nanoparticles have shown promising outcomes in improving the efficacy and bioavailability of vitamin E. Active targeting of nanoparticles loaded with vitamin D to cancer cells.

INTRODUCTION

Phytopathogens are the primary driver of plant illnesses that bring about huge harvest misfortunes, particularly in jungles. Anticipation or decrease of plant infection invasion is a significant worry of ranchers. Notwithstanding the advances underway horticulture, powerful administration of plant infection stays a test on account of the results of existing pesticides as the majority of them artificially engineered (bactericides, fungicides, among others [1]. Goldmines as they contain normal synthetics, which are adequate to human and creature frameworks. Every one of these synthetic substances can't be blended in labs. Numerous auxiliary metabolites of plant are industrially significant and discover use in various drug compounds [2]. Individuals have been reliant on plants for their medical services needs since the start of development [3]. The 2,50000 higher plant species on earth, more than 80,000 are restorative in Nature [4]. Ginger experimentally known

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as *Zingiber officinale* Roscoe, having a place with family *Zingiberaceae* is quite possibly the main plant with a few restorative, wholesome and ethanomedical values along these lines, utilized broadly worldwide as a zest, seasoning specialist and home grown cure [5]. Customarily, *Z. officinale* is utilized in Ayurveda, Siddha, Chinese, Arabian, Africans, Caribbean and numerous other restorative frameworks to fix an assortment of sicknesses viz, queasiness, regurgitating, asthma, hack, palpitation, aggravation, dyspepsia, loss of hunger, clogging, heartburn and torment Species from *Zingiberaceae* family have been generally utilized as flavours [6]. The expanded utilization of anti-infection agents has instigated microorganisms to procure opposition factors which have become a consuming situation. Red ginger (*Zingiber officinale* Roscoe var *rubrum*) has been developed because of its wide scope of corrective impacts. It is known as a fundamental creation of Indonesian society medication called Jamu [7]. Red ginger contains the most noteworthy fundamental oil among different variations of ginger planted in Indonesia, for example, *Zingiber officinale* Roscoe (regular ginger) and *Zingiber officinale* var. *amarum* (white little ginger) [8]. Ginger concentrate was set up from dried ginger and cancer prevention agents were improved utilizing dissolvable parcel [9]. Concentrates and portions were assessed for their cell reinforcement potential in various in vitro model frameworks. The arrangement of biofilm prompts protection from every antifungal class, bringing about the lone treatment being a medical procedure, to eliminate the tainted inserts. This is finished with a blend with high portions of antifungal medications [10]. Expulsion of inserts, for example, fake heart valves may expand the dangers in the patient's condition and isn't affordable. Besides, the utilization of high-portion antifungal medications can prompt liver and kidney harm [11]. Thus there is a pressing need to locate the option of chemotherapeutic medications in infections treatment especially those of plant birthplace which are effectively accessible and have significantly less results. The antimicrobial action of flavors is because of specific phytochemicals or fundamental oils present in ginger.

MATERIAL METHODS

Plant collection

Fresh, healthy, and young rhizome of *Zingiber officinale* were collected from Laycowin Organic, Herbal and Medicinal Products, Thanjavur (10.7821° N, 79.2756° E), Tamilnadu, India.

Plant material

The *Zingiber officinale* rhizome was dried up under shade, specifically diminish to a decently crude powder, and put away in golden hued sealed shut holders. The crude type of the medication was utilize for the declaration of physicochemical

boundaries similar to dampness content, debris esteems, increasing case, frothing evidence, unfamiliar natural issue, extractive qualities, and fluorescence analysis.

Phytochemical studies

Secondary metabolites in the present studies were carried out on the plant sample revealed the presence of medicinally active constituents. Beneficial drugs and to improve the patient health.

Preparation of extracts

The powdered plant samples of rhizome (100 g) were used for successive solvent extraction (500ml) with increasing order of polarities like ethanol, methanol. At that point it is kept in an orbital shaker at 190-220rpm for 48 hours. The supernatant was collected, filtered through Whatman No.1 filter paper and the extract were concentrated by a Rotary flask evaporator at a specific temperature was used based on the solvent system. Each time previous to extract through the next solvent the remains was dried thoroughly to remove the solvent used. The acquired dried concentrate was then precisely gauged, put away in little vials at - 20°C and utilized for the accompanying examinations.

Phytochemical screening

The preliminary phytochemical evaluation was carried out by using standard procedure [12-15].

Gas Chromatography-Mass spectrometry (GC-MS) analysis

Clarus 500 Perkin- Elmer (Auto System XL) Gas Chromatograph equipped and coupled to a mass detector Turbo mass gold – Perking Elmer Turbomas 5.2 spectrometer with an Elite-1 (100% Dimethyl ply siloxane), 300 m x 0.25 mm x 1 µm df capillary column was used for GCMS analysis. Initially, the instrument was set to temperature of 110°C, and then maintained at the same temperature for 2 min. At the end of this period, the oven temperature was raised up to 280°C, at the rate of an increase of 5°C per minute and maintained for 9 min. The temperature of injection port was ensured as 250°C and the flow rate of Helium as 1 ml/min. The ionization voltage was 70 eV. The samples were injected gradually in split mode as 10:1. The range of mass spectrum was set at 45-450 (mhz). The chemical constituents were identified by GC-MS. The discontinuity examples of mass spectra were contrasted and those put away in the spectrometer information base utilizing National Institute of Standards and Technology Mass Spectral information base (NIST-MS). The percentage of each constituent was calculated from relation peak area of each component in the chromatogram.

Identification of Compounds

Translation of mass range of GC-MS was directed

utilizing the information base of National Institute Standard and Technology (NIST) having in excess of 62,000 examples. The unknown component's spectrum was compared with the spectrum of the known components stored in the NIST library. The structure, name and sub-atomic load of the parts of the test materials was learned.

RESULTS AND DISCUSSION

The plants and its subsidiaries may considered as great wellsprings of characteristic phytochemicals for therapeutic uses, for example, against malignancy, diabetic mellitus, cardiovascular illnesses, maturing and different infections identified with extremist instruments. The consequence of the primer photochemical examination of this current investigation may offer trustworthiness to its ethno medicinal utilization.

Preliminary phytochemical screening

Saponin is utilized as a mellow cleanser and in intracellular his to science staining to permit immune response admittance to intracellular proteins. In medication, it is utilized in hypercholesterolaemia, hyperglycaemia, cell reinforcement, anticancer, calming, and weight reduction among others [16]. It is likewise known to have antimicrobial properties. India is in all probability the best maker of remedial flavors on the planet (Table 1).

Each constituent assumes a significant part and lack of any one constituent may prompt unusual advancements in the body [17]. While the component of activity controlled by tannins is by upsetting the worm's negative particle body surge into positive particles (protonization), which at that point pull in sure worm body proteins in the gastrointestinal

Table 1: Qualitative analysis of Phytochemicals analysis Zingiber officinale rhizome Extract.

S. No	Phytochemicals factor	Ethanol	Methanol
1.	Tannin	++	+
2.	Phlobatannins	+	+
3.	Saponin	+	+
4.	Flavonoids	++	+
5.	Steroids	-	-
6.	Terpenoids	+	+
7.	Triterpenoids	+	+
8.	Alkaloids	++	+
9.	Carbohydrate	+	-
10.	Protein	-	-
11.	Anthraquinone	-	-
12.	Polyphenol	++	+
13.	Glycoside	+	-

Indications: "+" means positive activity, "-" means negative activity

Figure 1 GC-MS Chromatogram of Zingiber officinale rhizome Ethanolic extract.

Table 2: GCMS analysis - Bioactive compounds *Zingiber officinale* rhizome Ethanolic extract.

S.NO	Retention time	Compound name	Molecular formula	Molecular Weight	Area (%)	Structure
1	15.22	Octanal	C ₈ H ₁₆ O	128	0.47
2	16.65	Endo-Borneol	C ₁₀ H ₁₈ O	154	0.188
3	17.16	Decanal	C ₁₀ H ₂₀ O	156	0.602
4	17.33	1,2-15,16- Diepoxyhexadecane	C ₁₆ H ₃₀ O ₂	254	1.072
5	18.92	Propanal,2- methyl-3-phenyl	C ₁₀ H ₁₂ O	148	1.692
6	20.15	Bicyclo[3.1.0] hexane-6-methanol, 2-hydroxy-1,4, 4-trimethyl	C ₁₀ H ₁₈ O ₂	170	3.15
7	20.26	7-epi-cis- sesquisabinene hydrate	C ₁₅ H ₂₆ O	222	1.59
8	21.34	Benzene,1- (1,5-dimethyl-4- hexenyl)-4- methyl	C ₁₅ H ₂₂	202	0.07
9	21.82	Aromadendrene oxide	C ₁₅ H ₂₄ O	220	0.12
10	28.8	4-((1H)-3- Hydroxy-1- propenyl)-2- methoxyphenol	C ₁₀ H ₁₂ O ₃	180	0.031
11	31.09	1b,4a-Epoxy- 2H-cyclopenta[3,4] cyclopropa[8,9] cycloundec[1,2-b]o	C ₂₂ H ₃₂ O ₈	424	0.47
12	32.20	2-Methylcortisol	C ₂₂ H ₃₂ O ₅	376	0.52

Table 3: GCMS analysis - Bioactive compounds *Zingiber officinale* rhizome Biological Activity.

S. No.	Retention time	Compound name	Molecular formula	Molecular Weight	Biological Activity
1	15.22	Octanal	C8H16O	128	Antioxidant activity and anti-inflammatory activities [18]
2	16.65	Endo-Borneol	C10H18O	154	Antinociceptive and anti-inflammatory activities
3	17.16	Decanal	C10H20O	156	Anti-Salmonella agents and antioxidant activity [19]
4	17.33	1,2-15,16- Diepoxyhexadecane	C16H30O2	254	Antitumor and anti-inflammatory agents
5	18.92	Propanal,2- methyl-3-phenyl	C10H12O	148	Various biological activities such as anti-inflammatory [20]
6	20.15	Bicyclo[3.1.0] hexane-6-methanol, 2-hydroxy-1,4, 4-trimethyl	C10H18O2	170	Anti-Candida and anti-inflammatory
7	20.26	7-epi-cis- sesquisabinene hydrate	C15H26O	222	Anti-cancer
8	21.34	Benzene,1- (1,5-dimethyl-4- hexenyl)-4-methyl	C15H22	202	Antimicrobial and Anti-inflammatory
9	21.82	Aromadendrene oxide	C15H24O	220	Anti HIV5,6, antifungal and antimicrobial
10	28.8	4-((1H)-3- Hydroxy-1- propenyl)-2-methoxyphenol	C10H12O3	180	Antioxidant, anti microbial and anti-inflammatory [21]
11	31.09	1b,4a-Epoxy- 2H-cyclopenta[3,4] cyclopropa[8,9] cycloundec[1,2-b]o	C22H32O8	424	-
12	32.20	2-Methylcortisol	C22H32O5	376	Anti-inflammatory [22]

parcel, accordingly disturbing the digestion and homeostasis of the worm's body (Figure 1) (Tables 2, 3).

The current investigation express that the presence of methyl or ethyl esters of unsaturated fats can likewise be considered as qualities of this plant [23]. From this outcome, it very well may be reasoned that every one of these mixes are of pharmacological significance as they have the properties, for example, antibacterial enemy of diabetic and pain relieving.

SUMMARY AND CONCLUSION

The ginger oil contains a mixture of constituents such as monoterpenes, namely phellandrene, camphene, cineole, linalool, limonene, citral, geraniol, citronellol, borneol and sesquiterpenes, namely α -zingiberene, *ar*-curcumene, β -bisabolene, β -sesquiphellandrene, zingiberol and zingiberenol along with some aliphatic aldehydes and alcohols [24]. The composition of volatile oil is highly variable depending upon a variety of factors including their geographical origin, distillation procedures, post harvest treatment, processing, drying conditions and temperature [25]. The present communication, we report essential oil composition of the rhizomes of *Z. officinale* from Ghaziabad region and its antimicrobial activity. Today, looking towards the side effects of modern medicine, the invention of novel active compounds against new targets is a matter of urgent priority in drug discovery. From the results obtained in the present investigation, it could be concluded that *Zingiber officinale* possesses remarkable bioactive compounds having therapeutic effects and can be considered a potential source of medicinal herb. *Zingiber officinale* possesses

remarkable antimicrobial activity, which is mainly due to naphthalenamine, decanal, and alfa.-copaene. According to these findings, it could be said that the ethanolic extract acts as antibacterial agents.

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