ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.ijrps.com

Phytochemical analysis and quantitative nutritional evaluvation of zingiber officinale roscae (Ginger)

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Article History:

Received on: 10 Jan 2020
Revised on: 12 Feb 2020
Accepted on: 15 Feb 2020

Keywords:

Zingiber officinale roscae -ginger,
Gas chromatography -GC,
Mass spectroscopy analysis-MS,
Phytochemical screening-PS

ABSTRACT

Evaluate the phytochemical analysis and nutritional value of the zingiber officinale roscae and its therapeutic utility. Phytochemical analysis is to determine the value of bioactive compounds and minerals in the plants. Phytochemical screening results showed that the presence of alkaloids, saponins, flavonoids, polyphenols, tannins like compound in the various extraction methods. The quantitative study was done by using gas chromatography method and mass spectroscopy analysis. Then the screening of all the analysis revealed that the plant has good metabolites which justify that it has therapeutic utility. The result of the proximate analysis is revealed that in zingiber officinale roscae. It is rich in calcium (46%) when compared to other elements like sodium, iron, cadmium, manganese, mercury which are present in the standard deviation value 1.007 to 0.005%. the most bioactive compound like gingerol, shagoal, curcumin and other compounds were shown in the qualitative analysis. The rhizome of zingiber officinale is also known as ginger. It is the most popular herb used in various foods and beverages and also traditional medicines. The herb is used to various diseases like stomach disorders, diabetes, hyper tension, cancer, spasm, etc .The chemical constituents which are present in the ginger like gingerol, shagoal, etc. The ginger has the properties like anticancer, antitumor, anti inflammatory, neuroprotective, hepto-protective activity etc.

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ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i2.2150

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INTRODUCTION

Zingiber officinale roscae (ginger) is a well-known tropical and sub-tropical shrub medical plant. It belongs to the *Family: zingerberaca* which contains about 1200 species in 50 genera belongs to monocotyledon family. It is semi-woody perennial rhizome plant about 3-4 mm higher. It grows rapidly in all the parts and of used for flavor and as therapeutic agents. This plant contains a wide variety of biologically active compounds, non-active compounds called phytochemicals, moreover it contains 400 compounds (Gupta, 2010; Mele, 2019) which include alkaloids, saponins, steroids, tannins, glycosides, amnioacids, proteins, vitamins which is widely used and has the properties like anticancer, antitumor, anti-inflammatory, neuroprotective , hepto-protective activity, antiemetic, analgesic, hypotensive, antioxidant etc. (Ugwoke and Nzekwe, 2011). This plant is being used from ancient times to treat various disorders like diabetes, snakebites, stomach disorder, toothaches respiratory disorders, bleedings and skin burns.

MATERIALS AND METHODS

Collection & preparations of the samples

The rhizome of zingiber officinale (ginger) were collected from a farm near Coimbatore, Tamilnadu, India. The collection of the sample was done by plucking the plants from the soil and placed into a plastic bag. The collected samples were washed and then dried, powdered and stored.

The Apparatus and reagent

The analysis of Na, Manganese, Fe, Cr, Cd, Lead, N, Hg (Table 1) were done by atomic absorption spectrophotometer.

To quantify the level of Sodium was done by flame photometer using standard Enlrich volumetric concentrated metallic ion calibration method. All the chemical reagents were grade checked and double distilled water were used.

Quantitative and Qualitative analysis -Gas chromatography technique and mass spectroscopy analysis

It consists of gc-2010 gas chromatography. The components were separated on Rtx-MS quartz capillary (60M x0.26M) with the cross band 95%. Dimethyl poly silicone at stationary phase 80 degree for 1min. 0.3mμ volume of sample injections with spilt ratio 1: 20 for 30mins.

This analysis is used for quantitative and qualitative compositions of the extract (Akindahunsi and Salawu, 2005; Bora and Sharma, 2010).

Table 1: Phytochemical analysis

Phytochemical screening	Values
Mineral elements	Compositions
Calcium	46.6 ±1.16
Sodium	31.2±0.15
Iron	25.5±0.6
Copper	25.5±0.3
Zinc	21±0.11
Manganese	15±.5
Chromium	3.70±0.008
Cadmium	0.070±0.03
Lead	1.050±0.02
Nickel	0.070±0.01
Mercury	0.20±0.01

Phytochemical screening

To analyze the presence of alkaloids, saponins, tannins, steroids, glycosides, terpenoids, phlobotannins were carried out by method harbored.

Table 2: Quantitative analysis of 100% (petroluem etherextract)

Compounds	Areas %
Gingiberene (15.4%)	(15.4)
Beta-seiquphelendene	(18.1)
Curcumen	(11.2%)
Glycohexanonal	(0.6)%
Gingerol	(4.46%)
Shagoal	(7.45%)
Cadinene	(1.2%)

Alkaloid

5g of ginger extract with 5 ml of pure honey was mixed with 5ml of 1% aqueous HCL stream 1ml few drops of dragged off reagent. The presence of blue-black color turbidity indicates that the presence of alkaloids.

Saponin

5grams of ginger extract with 5 ml honey was shaken with distilled water it results frothing, presence of saponins.

Tannins

5grams of ginger extract with 5-6ml honey with distilled water and filtered. Tannins results Blue black color appearance.

Phlobotannins

Observation of red precipitate, determine that phlobo-tannins is present.

Flavonoids

5 ml of dilute of ammonium solution were added with filt. Con. H_2SO_4 inside of the test tube. Yellow colorations -determine that the presence of flavonoids.

Steroids

2 ml of acidic hydride with 0.5grams of extracts with 5ml of con.H_2SO_4, were added inside of the test tube. The presence of violet coloration results steroid.

Terpenods

0.6 grams of ginger extract with 2ml of chloroform was added with con.H_2SO_4 results brown coloration.

RESULTS AND DISCUSSION

The Phytochemical analysis of zingiber officinalis shows with peak value of the chemical composition of the extract by CG-MS facilitate to identify the bioactive compounds (Ajedi *et al.*, 2019).

Table 3: Composition of zingiber officinale rhizome (mg/100Dm) ± standard deviation

Bioactive	Methanol extract	Ethanol extract	Petroleum ether extract
Alkaloids	+++	+++	-
Tannins	++	-	-
Glycosides	++	+	+
Saponins	+++	+++	-
Steroids	–	-	+
Flavonoids	++	++	++
Terpenoids	+	-	-
Phlobotannins	+	+	++
Polyphenols	++	+	+
Anthraquinone	-	-	-
Anthranoids	–	-	-

Table 4: 4-Quantitative analysis: Ethanolic extract (100%)

No.	RT	Area (%)	Compounds
1.	6.3	0.061	Cineole
2.	8.3	0.682	Campol
3.	11.3	0.233	Cyclo-isosativene
4.	11.7	0.484	Tricyclo
5.	12.4	0.354	Beta- Farnesene
6.	12.7	0.276	2,6,10Dodecatrien-1-ol
7.	12.7	0.847	Spiro [4,5] dec
8.	13.6	10.278	Curcumin
9.	13.8	19.579	Gingiberene
10.	12.6	8.770	Fernesene
11.	13.5	9.611	Cyclo Hexane
12.	13.4	2.412	Cadinene
13.	13.7	11.713	β Seiquphellandrene
14.	14.5	0.144	α Pano-sinsen
15.	15.4	0.055	B-Nerolidol
16.	22.6	6.456	Cis-6-Shagole
17.	23.2	3.467	Gingerol
18	24.1	0.968	Gingerol
19.	24.6	0.639	Capsaicin
20.	25.8	0.840	Trans-10-Shagole
21	18.3	0.651	δ Tocopherol

The major substance which are present in the ethanolic extract (Table 2, Table 4, Table 5), (Rahmani *et al.*, 2014) were Gingiberene (20.4%), Beta-seiquphelendene (12.1%), Curcumin (11.2%), Glycohexanonal (0.6%), Gingerol (4.46%), Shagoal (7.45%) and etc. The methanolic petroleum ether extract were Gingiberene (15.4%), Beta-seiquphelendene (18.1), Curcumen (11.2%), Glycohexanonal (0.6%), Gingerol (4.46%), Shagoal (7.45%), Cadinene (1.2%) etc. (Ajedi *et al.*, 2019) are present.

Phytochemical screening

To analyze the presence of alkaloids, saponins, tannins, glycosides, terpenoids, phlobotannins were present (Table 3) in the methanolic and ethanolic and petroleum ether extract (Morakinyo *et al.*, 2011) in the absence of steroids (Bora and Sharma, 2010).

The glycoside plays the vital role to the support its strength and the rate of contraction, alkaloids

Table 5: Quantitative analysis : Methanolic extract (100%)

No.	RT	Area (%)	Compounds
1.	12.43	0.121	β Farnesene
2.	12.8	0.281	Spiro [4,5]
3.	13.0	7.311	Curcumen
4.	13.2	14.432	Gingiberene
5.	13.9	75.22	Fernesene
6.	13.5	7.629	2,6,10Dodecatrien-1-ol
7.	13.5	1.713	γ –cadinene
8.	13.8	10.88	β Sei-quphellandrene
9.	14.4	0.92	B Nerolidol
10.	15.8	0.90	Zingiberen
11.	15.9	0.199	Guaol
12.	15.9	0.264	Di-methyl-3,8 Nonadien-2-one
13.	16.1	0.376	qisabinene Hydrate
14.	16.3	0.448	Rosifaliol
15.	16.4	0.554	β – Bisabolol
16.	16.8	0.620	3Farnesol
17.	17.5	0.729	Gemacron
18.	18.3	0.870	2-Norbornanone
19.	18.4	0.983	Thiiofenchone
20.	18.6	0.031	Veridiflorol
21.	19.1	0.139	Dlepi αCedrenepoxide
22.	19.4	0.233	Methyl Icosanoate
23.	19.7	0.324	Verbenol 3 Caren
24.	19.9	0.432	Curcumene
25.	20.1	0.595	Carveol
26.	20.7	0.615	β - pinen, 3(acetylmethyl)
27.	21.0	0.746	Methyl linoleate
28.	21.3	0.850	2,5 dibutyl-furan
29.	21.6	0.942	Decalin,
30.	22.0	0.020	Nerol propionate
31.	22.6	4.172	6 shagaol
32.	23.0	12.278	Gingerol
33.	23.6	0.320	2- Formy thexadecane
34.	24.1	0.475	Lariciresinol
35.	24.4	1.536	Gingerol

have more physiological effects on the humans is more used in the relief of pain, saponions (Table 2) shows the strong expectorant and it help in the absorption of nutrient. Flavoids were possess more antioxidant properties to strengthen the capillary walls. Overall, the phytochemical and bioactive compounds of the zingiber officinalis (Uddin *et al.*, 2013) shows many properties like anticancer, anti-tumor, anti-inflammatory, neuroprotective, hepto-protective activity, antifungal, antibacterial, Gastro-protective activity (Weidner and Sigwart, 2000).

Spectrophotometer is to analysis the mineral elements (Table 1) which are zingiber officinalis like iron, sodium, zinc, calcium, Mn, Cr, Cd,Hg and N. Zingiber officinalis contain less amount of iron(26.6%g), low amount of mercury and zinc. The amount of sodium which present in zingiberofficinalis 31.2% and calcium [1] obtained more amount 47.60%, its plays important role for blood coagulation and also for the intracellular component.

CONCLUSION

Zingiber officinalis extract solvents of various forms have more pharmacological values, because it contains alkaloids, saponins, tannins, glycosides, terpenoids, phlobatannin and other essential compounds. So it is considered to be a potential source of medicinal herbs. We can extend research on its properties.

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