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Antioxident, Phytochemical Analysis and Phase of Alpinia Galangal Rhizome

Dr. T. S. JAYANTHI
Associate Professor, Department of Physics, Vivekananda College, Agasteeswaram, Kanniyakumari District, Tamilnadu, India

Plants have the capacity to translate the energy from the sun to chemical products or metabolites, which are consequently converted to food and medicine for use by man and animals reviewing of the genus Alpinia showed its incredible biopharmaceutical potentials as evident from earlier published reports and are gaining the attention of researchers from different disciplines. The presence of the bioactive substances such as flavonoids, tannins and terpenes is the key for its therapeutic efficiency. From the present work prepare the crude extract of alpinia galangal rhizome the solvents hexane, ethyl acetate and methanol and examine it FTIR, phytochemical, screening study and anti-oxidant analysis.

Keywords : FTIR, Alpinia, Anti-Oxidant

I. INTRODUCTION

India is one of the mega-diversity centres harbouring a multitude of medicinal plant species of economic importance. Zingiberaceae is a family of medicinal and economic significance. The family Zingiberaceae is distributed widely throughout the tropics, particularly in Southeast Asia and it is well known for its immense medicinal values. India is one of the richest and diverse regions for Zingiberaceae, having 22 genera and about 170 species [1]. Zingiberaceae family constitutes a fundamental group of rhizomatous medicinal and aromatic plants which were characterized by presence of volatile oils and oleoresins, due to its high export value. Zingiberaceae family is a vital natural resource useful in many products for food, spices, medicines, dyes and perfume. The rhizomes and fruits are aromatic, tonic and stimulant; occasionally they are nutritive. A few are used as food as they contain starch in huge quantities while others yield an astringent and diaphoretic juice. The important genera coming in Zingiberaceae are *Curcuma, Kaempferia, Hedychium, Amomum, Zingiber, Alpinia, Elettaria* and *Costus.* In the genus *Alpinia*, *A. galangal* is the most significant one, which finds different uses in ayurvedic preparations such as “Rasnadi powder” [2].

1.1 Morphology of *A. galangal*

Root stocks of *A. galangal* are tuberous and to some extent aromatic. Leaves are oblong lanceolate, glabrous, acute, green above, paler beneath, with somewhat callus white margins, sheaths are long and glabrous, ligule are short and rounded. Flowers of the plant are greenish white, in dense flowered, 30 cm Panicles; bracts ovate-lanceolate. Calyx is tubular, unevenly 3-toothed. Corolla lobes oblong, claw green, blade white, striated with red, more than 1 cm long, broadly elliptic, shortly 2-lobed at the apex part with a pair of subulate glands at the base of the apex and with a pair of subulate glands at the base of claw. Fruit is look like small cherry, orange red [2].

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Fig-1a &b Morphological features of plant and rhizome of *A. galangal*

Fig-2. *Alpinia galangal* rhizome

1.2 Chemical constituent of *A. galangal*

The compounds to be present in the plant viz. camphene, myrcene, 1, 8-cineole, α- enchol, camphor, α-fenchyl acetate, carotol, guaiol etc are recognized to be responsible for the characteristic odour in addition to have the medicinal properties. It also contains phenylpropanoids like acetoxychavicol acetate (ACA), acetoxyeugenol acetate and p-coumaryl diacetate, liable for the anti-tumour, anti-HIV and anti-parasitic activities [3].

1.3 Uses of *A. galangal*

A. galangal Linn is an aromatic rhizomatous herb and the main important crop plant of family Zingiberaceae which is cultivated in India, China, Thailand, Malaysia and Indonesia. Many *Alpinia* species are valued for their medicinal properties and are also used in traditional medicines as a spasmolytic, hypotensive, anti-emetic, anti-oxidant, anti-inflammatory, bacteriostatic, fungistatic property in India, China and other regions [4]. *A. galangal* is commonly known as greater galangal. It's harvesting management at 3 months-interval from 6 to 48 months subsequent to planting. Harvesting the crop at 42 months after planting was the most excellent for realizing greatest rhizome and for obtaining oils of superior quality (27.1% cineole [Eucalyptol]). The shoot was developed maximum at 18 months subsequent to planting. *A. galangal* reached a maximum height of 129.4 cm with more than 48 tillers per clump and 13 leaves per tiller in the trial location.

1.4 Importance of *Alpinia galangal*

Alpinia galangal L. is a rhizomatous plant which is cultivated in many countries like India, Indonesia, Malaysia, Thailand, and China [5]. Selected *Alpinia* specieses are extensively used in tradional medicines mostly in Asian countries due to their ethonobotanical activities like anti-emetic, anti-oxidant, spasmolytic, antiinflammatory, bacteriastatic [6-7]. Its rhizomes are also used as flavouring agent. As its smells like cardamom it is used as spices and condiment. The rhizome product has enough importance to treat much disease like rheumatism, ulcers, colds, whooping cough, vomiting, throat infections, stomach ache and indigestion. The essential oil present in this plant is also equally

important for health care [8] has also reported that its phytoconstituents have antiulcer, antitumour, anticalculi properties along with anti-HIV agents [9]. With these above understanding, the present study deals with the analysis of phytochemical constituents and antioxidant potential of *Alpinia galangal* Linn.

II. PREPARATION METHODS

2.1 Plant Material

The rhizome of *Alpinia galangal* was collected from Mettur, Salem district during November and December (38 ± 1°C) in the year 2017.

2.2 Extraction and Phytochemical Analysis

The rhizome of *Alpinia galangal* was washed with water and shade dried at room temperature for 15 days. After drying, the sample was coarsely powdered with a grinder. The dry sample (30 g) was sequentially extracted with hexane, ethyl acetate and methanol. The extracts were evaporated to dryness in vacuum and stored in cold until used.

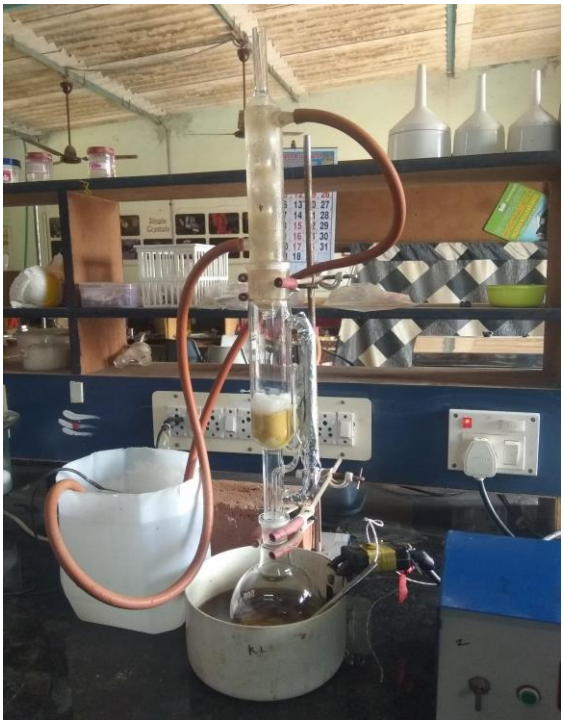

Fig-3. Soxhlet extraction of *Alpinia galangal* rhizome material

The plant material was subjected to shade drying, then the shade dried plant material was subjected to pulverization to get coarse powder and it was extracted in a Soxhlet apparatus using various solvents according to their polarity

2.3 Materials required

Shade dried rhizome powder of *Alpinia galangal* was extracted with hexane, ethyl acetate and methanol.

2.4 Preparation of Extracts

Hexane Extract

The crude powder 30 gm was extracted with 300 mL of hexane (60°- 80°C) using soxhlet apparatus by continuous hot percolation method. The resulting extract was concentrated to afford 2.02 g crude.

Ethyl acetate extract

The remaining residue was extracted with 300 mL of ethyl acetate (70°C). After extraction it was filtered and the removal of solvent was done under reduced pressure by distillation process. 2.54g of crude material was obtained.

Methanolic Extract

The marc remains after ethylacetate extraction was dried and then it is extracted with 300 mL of methanol. After extraction, it was filtered and concentrated. After concentration 5.4 g crude was obtained.

III. RESULTS AND DISCUSSION

3.1 Phytochemical screening of *A.galangal* extracts

Results of the phytochemical screening of the various extracts from the rhizome of *A. galangal* in **Table 1.**

Table 1. Phytochemical screening on flowers extracts of *Alpinia galangal*

Test	Hexane	Ethyl acetate	Methanol
1) Alkaloid test			
A) Dragendorff's test	++	++	++
B) Hager's test	+	++	++
C) Wagner's test	+	+	++
2)Test for terpenoids			
A) H_2SO_4 test	+++	+	+
3) Test for Phenols and Tannins			
A) Lead acetate test	++	+	++
B) Neutral $FeCl_3$ test	–	–	–
C) Gelatin test	+	+	+
4) Protein & amino acid			
A) $CuSO_4$	–	–	–
B) Ninhydrin	–	–	–
5) Carbohydrate			
A)Molisch's test	+	-	+
B)Benedict's test	+++	++	+++
C) Fehling's test A & B	–	–	+
6) Glycosides			
A) Keller-killani test	+++	++	-
7) Saponin	-	-	+
8) Oil & fat	+++	–	+

Phytochemical screening results showed that alkaloids, terpenoids, phenols, carbohydrate glycosides, oils & fats were present in the rhizome crude extracts of A. galangal. But, the crude extracts from leaf samples did not show any colour change for proteins and amino acids. Terpenoids and alkaloids present in all the crude extract. Oil was absent in only in ethyl acetate extract.

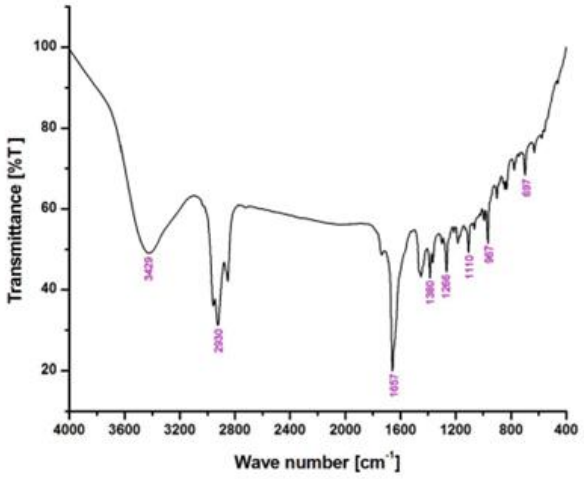

Fig-4. FT-IR spectrum for hexane extract of *Alpinia galangal rhizome*

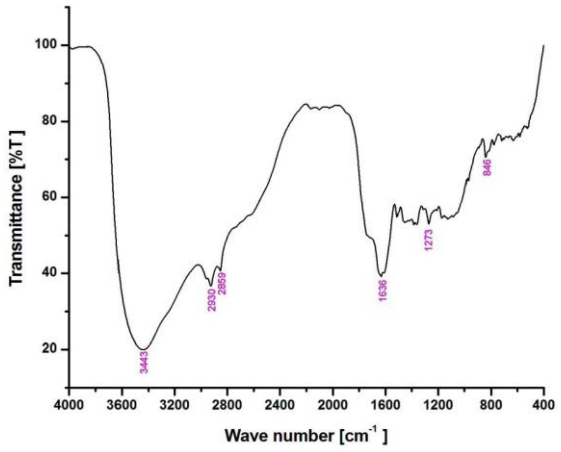

Fig-5. FT-IR spectrum for ethyl acetate extract of *Alpinia galangal rhizome*

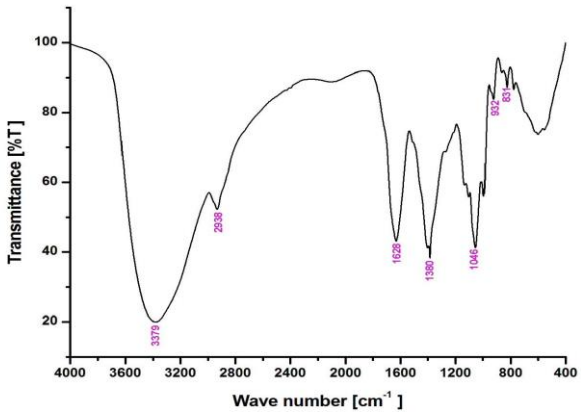

Fig-6. FT-IR spectrum for methanol extract of *Alpinia galangal rhizome*

Table 2. Infrared absorption frequencies (cm^{-1}) for hexane extract of *Alpinia galangal*

S. No	Absorption frequencies cm^{-1}	Possible Characteristic functional group
1.	3429	OH stretch, alcohol
2.	2930	C-H stretch, Asymmetric
3.	1657	C=O Stretch, acid
4.	1380	OH bending, phenol
5.	1266	CN stretch, amine
6.	1110	C-O stretch, alcohol
7.	967	C-H bend, aromatic

Table 3. Infrared absorption frequencies (cm^{-1}) for ethyl acetate extract of *Alpinia galangal*

S. No	Absorption frequencies cm^{-1}	Possible Characteristic functional group
1.	3443	OH stretch, alcohol
2.	2930	C-H stretch, asymmetric
3.	2859	C-H stretch, symmetric
4.	1636	C=O stretch
5.	1273	CN stretch, amine

Table 4. Infrared absorption frequencies (cm^{-1}) for methanol extract of *Alpinia galangal*

S. No	Absorption frequencies cm^{-1}	Possible Characteristic functional group
1.	3379	OH stretch, alcohol
2.	2938	C-H stretch, asymmetric
3.	1628	C=O stretch
4.	1380	OH stretch, phenol
5.	1046	C-O stretch, alcohol
6.	932	C-H stretch, aromatic

The IR spectrum of different extracts reveals structural information about major and minor constituents. The peak at 3379, 3443 and 3429 cm^{-1} assigned to the O-H stretching vibration of alcohol. In addition, the peak at 1628, 1657 and 1636 cm^{-1} assigned to the C=O stretching vibration means that some carbonyl compounds existed in the rhizome extracts. So, depending on the fingerprint characters of the peaks positions, shapes and intensities, the fundamental components may be identified.

3.2 Anti-oxidant studies

Plants have diverse groups of phenolic compounds, such as simple phenolics, phenolic acids, anthocyanins, hydroxycinnamic acid derivatives and flavonoids. All these phenolic classes have gained extensive attention because of their physiological functions, including free radical scavenging, anti-mutagenic, anti-carcinogenic and anti-inflammatory effects. In present work, free radical scavenging activity of ethyl acetate and methanol crude extract were measured by 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay.

Table 5. DPPH radical scavenging activity of ethyl acetate and methanol

Crude extract	% of inhibition					IC_{50} µg/ml
	50 µg/ml	100 µg/ml	150 µg/ml	200 µg/ml	250 µg/ml	
Ethyl acetate	24.36	38.01	50.39	61.56	70.49	156
Methanol	30.55	42.14	57.34	65.76	78.66	128
Ascorbic acid	45.21	61.55	79.67	91.46	97.78	58.7

Using DPPH radical scavenging method stated above, for antioxidant study of ethyl acetate and methanol extracts illustrated a clear picture of methanol extract being more potent than ethyl acetate .

IV. CONCLUSION

The solvents hexane, ethyl acetate and methanol were used to prepare the crude extract of Alpinia galangal rhizome. The results of the present phytochemical screening study established the presence of biologically active phytochemicals in the flower extract. The data also suggested that the rhizome extract contain significant amounts of alkaloids, terpenoids, glycoside and Carbohydrates. FT-IR studies performed to identify the various phytochemicals and functional group present in extracts, respectively. For anti-oxidant studies, DPPH radical scavenging activity was performed for ethyl acetate and methanol extract. The methanol extract showed significant antioxidant activity.

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