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Phytochemical Characterization of *Alpinia Galanga* Plant of Pakistan

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Abstract

Alpinia galangal, often recognized as galangal or Greater Galangal is a perennial plant extensively cultivated throughout Asian countries especially in Pakistan, Indonesia, and Europe-Mediterranean region. This plant contains a number of phytochemical substances such as anthraquinone glycoside, flavonoid, glycosides, saponins, sterols, tannins, terpenoids, fixed oils, fats, etc. and it is well known for treating a number of diseases. The object of the present investigation is to confirm the presence of different phytochemical compounds in Alpinia galangal by standard methods reported in the literature. In the preliminary phytochemical screening, tests for alkaloid, anthraquinone glycosides, carbohydrates, flavonoids, fixed oils and fats, phenols, proteins, saponins, sterols, tannins, and terpenoids have been performed using different methods. The result indicates the presence of anthraquinone glycosides, carbohydrates, flavonoids, fixed oils and fats, carbohydrates, glycosides, saponins, sterols, tannins and terpenoids. However, the tests for alkaloids, phenols and proteins showed negative results. Interestingly, alkaline reagent test and lead acetate test for flavonoids was positive whereas, sulphuric acid test was negative. The study would be of great importance for setting up the quantitative determination of these phytochemical compounds. In addition, Separation techniques could also be designed, and the separated compound can be studied for its pharmacological activities.

Keywords

Alpinia galangal, gangal rhizome, greater galangal, Phytochemical compounds.

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1.INTRODUCTION

Phytochemicals are widely used in traditional cultures around the globe. They have gained much attention as natural alternatives to synthetic chemicals in developed and developing countries because of their natural origin and less side effects. Alpinia galanga belongs to *Zingiberaceae* family. It occurs in Pakistan, Indonesia, and Europe-Mediterranean region [1-2]. Alpinia galanga is often recognized as Greater Galangal [1-4]. It is 6 to 7 ft. high and bears perennial thick rhizomes which are deep orange brown in color, pungent and bitter. The fruits are about ½" prolonged, holds 3 to 6 seeds. The leaves are shaped like a lance head while the flowers are greenish white [5]. It has an aromatic ginger like odour and hot and spicy taste; therefore, it is widely used in foods as condiment [6]. Since it has various medicinal uses, therefore it has been utilized in Chinese and Ayurvedic medicine as well as in Europe from the very early times [7-8]. This plant contains a number of phytochemicals such as anthraquinone glycoside, flavonoids, glycosides, saponins, sterols, tannins, terpenoids, fixed oil and fats [4,9]. For the extraction of these active compounds from natural

products many solvents and methods are available. These methods include Soxhlet extraction, sonication, maceration, heating under reflux, and supercritical fluid extraction [7]. It is used in cardiovascular diseases, dyspepsia, fever, burning of liver, flavoring agent, rheumatic pains, diabetes, chest pain, and renal diseases [3]. Though rhizome is considered to contain the most effective phytochemicals, the flowers of galangal are also a very important part of the plant as they exhibit antioxidant and antibacterial activity [10].

The rhizome exhibits stimulant and stomachic effect. Rhizome is utilized as antitumor, antibacterial, antifungal, antioxidant, antiulcer, anti-inflammatory, immunomodulator, anthelmintic, anti-HIV virus-1, antiplatelet, hypolipidemic, analgesic and antidiabetic [11]. The taxonomical classification is given in **Table 1**.

Table 1: Taxonomical classification

Kingdom	Plantae
Order	Zingiberals
Family	Zingiberacae
Subfamily	Alpinioidae
Tribe	Alpineae
Genus	Alpinia
Species	Galangal

1.1. Ethnomedicine

The rhizome exhibits stimulant and stomachic effect. Rhizome is utilized as antitumor, gastric tonic, anti-helminthic, anti-emetic, anti-inflammatory, anti-microbial, anti-fungal, anti-dementia, anti-ulcerative, tonic, expectorant, stomachic, aphrodisiac and carminative. It is also used in cardiovascular diseases, dyspepsia, fever, burning of liver, flavoring agent, rheumatic pains, diabetes, chest pain, and renal diseases. Seeds are mostly utilized as anti-fungal, cardio tonic and diuretic [7,12-14].

2. Materials and Methods

2.1. Plant Materials and Extraction

The rhizomes of *Alpinia galanga* were bought from the local market of Karachi and after identification it was immersed in ethanol for three days. The extracts were filtered, and the solvent was removed under reduced pressure through rotary evaporator. The ethanolic extracts thus obtained were investigated for different classes of biochemical compounds and for pharmacological activities.

2.2. Phytochemical Screening

Preliminary phytochemical screening was performed for the detection of following classes of compounds by standard methods as reported in the literature.

2.2.1. Test for alkaloid

a) **Dragendorff's test:** 5ml of distilled water is added to 2mg extract. After this 2M HCl and Dragendorff's reagent is added, it results in the formation of orange or red precipitate [15].

b) **Wagner's test:** In 2mg extract a 1.5% HCl and few drops of Wagner's reagent is added, it results in the formation of yellow or brown Precipitate [15].

2.2.2. Test for Anthraquinone glycoside

a) **Hydroxyanthraquinone test:** In 1ml extract, a few drops of 10% KOH solution which results in red color [16].

2.2.3. Test for Carbohydrates

a) **Fehling's test:** 1ml Fehling A reagent and 1ml Fehling B reagent was added to extract and boil a development of Brick red precipitate indicate the presence of carbohydrates [17].

b) **Iodine test:** In an extract a 2ml iodine solution is added which results in dark blue/purple color [17].

c) **Molisch's test:** 2ml Molisch reagent was added to an extract and 2ml concentrated H_2SO_4 resulting in the appearance of violet ring. [17].

2.2.4. Test for Flavonoid

a) **Alkaline reagent test:** 5 drops of 5% NaOH solution was added to 1ml extract with a few drops of 2M HCl. Observation was colorless [16].

b) **Lead acetate test:** 5 drops of lead acetate was added to 3ml extract. The appearance of white or cream precipitate confirms the presence of flavonoid [18].

c) **Sulphuric acid test:** Few drops of Conc H2SO4 were added to an extract. Orange color confirms the presence of flavonoid [18].

2.2.5. Test for Fixed oil and fats

a) **Biuret's test:** 5 drops of 1% copper sulphate in 2ml extract after this 2ml of 10% NaOH was added which results in purple/violet color [16].

2.2.6. Test for glycosides

a) **Keller Kiliani test:** 0.4ml of glacial acetic acid, few drops of 5% ferric chloride and 0.5 ml of concentrated H_2SO_4 was added in an extract.

The appearance of blue color confirms the presence of glycosides [16].

b) Salkowski's test: 2ml of chloroform was added to an extract after this 2ml of H_2SO_4 (conc.) was added that results in reddish brown color [17].

2.2.7. Test for phenols

a) Ferric chloride test: In an extract a 5% ferric chloride was added that results in deep blue/black color [18].

2.2.8. Test for proteins

a) Biuret's test: 5 drops of 1% copper sulphate and 2ml of 10% NaOH was added in 2ml extract that results in purple/violet color [16].

2.2.9. Test for quinones

a) Quinones test: In an extract, 5ml of conc. HCl was added. Development of yellow color indicates the presence of quinines [18].

2.2.10. Test for saponins

a) Foam test: In an extract a few drops of distilled water is added then shake. Persistent foam confirms the presence of saponin [18].

2.2.11. Test for sterols

a) Salkowski's test: 2ml of chloroform was added to an extract, after this 2ml of H_2SO_4 (conc.) was added that produce reddish brown color [15].

b) Acetic Acid test: In an extract 2ml chloroform, 2ml of H_2SO_4 (conc.) and 2ml of acetic acid was added, appearance of green color confirms the presence of sterol [17].

2.2.12. Test for tannins

a) Ferric chloride test: Few drops of 5% ferric chloride were added to an extract, green/brown color indicate the presence of tannins [15].

2.2.13. Test for terpenoids

a) Salkowski's test: 2ml of chloroform and 2ml of H_2SO_4 (conc.) was added to an extract, reddish brown color confirms the presence of terpenoids [16].

3. RESULTS AND DISCUSSION

Table 2 indicates the presence of different phytochemical components of *Alpinia galanga*. The ethanol extracts obtained from the rhizomes of *Alpinia galanga* contained a number of phytochemical compounds such as anthraquinone glycoside, flavonoid, glycosides, saponins, sterols, tannins, terpenoids, fixed oil and fats. Presence of anthraquinone glycoside confirms the laxative, antimicrobial and anti-inflammatory property, positive results of flavonoids and tannins confirms the antioxidant activity, saponins presence confirms the antidiabetic activity and the terpenoids result confirms the analgesic property of *Alpinia galangal.*

Table 2. Test Results of Phytochemical Compounds

Alkaloid	Dragendorff's test	-
	Wagner's test	-
Anthraquinone Glycosides	Hydroxyanthraquinone	+
Carbohydrates	Fehling's test	+
	Iodine test	+
	Molisch's test	+
Flavonoid	Alkaline reagent test	+
	Lead acetate test	+
	Sulphuric acid test	-
Fixed Oil & Fats	Biuret's test	+
Glycosides	Keller Kiliani test	+
	Salkowski's test	+
Phenols	Ferric chloride test	-
Proteins	Biuret's test	-
	Quinones test	-
Saponins	Foam test	+
Sterols	Salkowski's test	+
	Acetic Acid test	+
Tannins	Ferric chloride test	+
Terpenoids	Salkowski's test	+

5. CONCLUSION

The data presented in this study confirms the presence of different phytochemical compounds in the *Alpinia galanga* species available across Pakistan. This study is of great importance especially for researchers in Pakistan and can be used further for extraction of different compounds present in *Alpinia galangal.* The extracted compounds can be studied further for different clinical and preclinical pharmacological activities known for those specific compounds.

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