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Phytochemical Screening of Aqueous Tuber Peel Extracts of *Colocasia Esculenta* and *Amorphophallus Paeoniifolius*

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Abstract

The present study investigated the phytochemical composition of aqueous tuber peel extracts of Colocasia esculenta and Amorphophallus paeoniifolius. Although commonly discarded as agricultural waste, tuber peels contain valuable bioactive compounds with medicinal and industrial relevance. Fresh peels were shade dried, powdered, and extracted using distilled water, followed by preliminary qualitative phytochemical screening using standard biochemical methods. The analysis confirmed the presence of alkaloids, flavonoids, phenolics, tannins, saponins, glycosides, terpenoids, carbohydrates, proteins, and steroids in varying amounts. Colocasia esculenta extract showed higher flavonoid, phenolic, and tannin content, indicating strong antioxidant potential, whereas Amorphophallus paeoniifolius extract exhibited comparatively higher alkaloid and terpenoid content associated with antimicrobial and anti-inflammatory activities. These findings highlight the therapeutic and nutritional importance of both peel extracts and suggest their potential application as eco-friendly and sustainable sources of bioactive compounds for pharmaceutical, antioxidant, biomedical, and biodegradable packaging applications.

Keywords: Phytochemical screening, *Colocasia esculenta, Amorphophallus paeoniifolius and* Bioactive compounds

1. Introduction

Medicinal plants have been extensively utilized since ancient times for the treatment and prevention of various diseases due to the presence of biologically active compounds known as phytochemicals [1]. These natural compounds possess significant therapeutic and pharmacological properties and are widely used in traditional as well as modern medicine [2]. Phytochemicals such as alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, terpenoids, and steroids are known to exhibit diverse biological activities including antioxidant, antimicrobial, anti-inflammatory, anticancer, antidiabetic, and wound-healing properties [3,4]. These compounds help in protecting the human body against oxidative stress and microbial infections by scavenging free radicals and inhibiting the growth of pathogenic microorganisms [5].

In recent years, increasing environmental concerns and the demand for sustainable resources have encouraged researchers to explore agricultural wastes as valuable

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sources of bioactive compounds [6]. Plant-based wastes such as fruit peels, vegetable residues, and tuber peels are now recognized for their rich phytochemical composition and potential applications in pharmaceutical, nutraceutical, biomedical, and biodegradable packaging industries [7]. Utilization of such waste materials not only reduces environmental pollution but also adds economic value through the recovery of useful natural compounds [8].

Colocasia esculenta is an important edible tuber crop widely cultivated in tropical and subtropical regions and is valued for its nutritional and medicinal properties [9].

The plant contains carbohydrates, proteins, vitamins, minerals, flavonoids, and phenolic compounds that contribute to its antioxidant and therapeutic potential [10]. Traditionally, different parts of the plant have been used in folk medicine for the treatment of inflammation, digestive disorders, and microbial infections [11]. Similarly, Amorphophallus paeoniifolius is a medicinal tuber crop commonly used in traditional Indian medicine [12]. The tuber is rich in alkaloids, tannins, phenols, and terpenoids, which contribute to its antimicrobial, anti-inflammatory, antioxidant, hepatoprotective, and anticancer activities [13]. It is also nutritionally important due to its high dietary fiber and mineral content [14]. Although the edible portions of these tubers are commonly utilized, their peels are generally discarded as agricultural waste despite containing valuable phytochemical constituents [15]. Previous studies have reported that tuber peels possess appreciable antioxidant and antimicrobial properties because of their rich secondary metabolite content [16].

Therefore, the utilization of tuber peels may contribute to waste management, sustainable development, and the production of eco-friendly biomaterials [17]. The present study was undertaken to perform preliminary phytochemical screening of aqueous tuber peel extracts of *Colocasia esculenta* and *Amorphophallus paeoniifolius* and to compare the presence of various secondary metabolites that may contribute to their biological activities and industrial applications.

2. Materials and Methods

2.1. Collection of Plant Materials

Fresh tubers of *Colocasia esculenta* and *Amorphophallus paeoniifolius* were collected from local agricultural fields. The peels were separated manually, washed thoroughly with distilled water, and shade dried for several days.

2.2. Preparation of Peel Powder

The dried peels were powdered using a mechanical grinder and stored in airtight containers for further analysis.

2.3. Preparation of Aqueous Extract

Fig. 1. Elephants ear and foot yam

The Fig.1. shows the Elephant's ear and foot yam as follows, Ten grams of peel powder from each sample were mixed with 100 mL of distilled water and heated at 60–70°C for 30–45 minutes. The extracts were cooled and filtered using Whatman No.1 filter paper. The filtrates ob-

tained were used for phytochemical screening. The Fig.1. shows the Elephant's ear and foot yam as follows,

2.4. Phytochemical Analysis

The plant extract solutions were assessed for the existence of the phytochemical analysis by using the following standard methods. [18]

2.4.1. Test for Carbohydrate

To 0.5ml of the extract of the plant sample, 1ml of water and 5-8 drops of Fehling's solution was added at hot and observed for brick red precipitate.

2.4.2. Test for Alkaloid

The solvent free extract (50mg) was stirred with one ml of dilute hydrochloric acid and filtered. The filtrate was tested for alkaloids. Mayer's Test: To the filtrate, a drop of Mayer's reagent was added along the sides of the test tube. A white precipitate indicates the test as positive.

2.4.3. Tests for Flavonoid

Taken 2 ml of 2.0% NaOH mixture was mixed with plant extracts; concentrated yellow color was produced, which became colorless when we added 2 drops of diluted acid to mixture. This result showed the presence of flavonoids.

2.4.4. Test for Steroid

Added 2 ml of chloroform and concentrated H_2SO_4 were added with the 5 ml plant extracts. In the lower chloroform layer red color appeared that indicated the presence of steroids [19].

2.4.5. Test for Terpenoid

Added 2.0 ml of chloroform was added with the 5 ml plant extracts and evaporated on the water path and then boiled with 3 ml of H_2SO_4 concentrated. A grey color formed which showed the entity of terpenoids.

2.4.6. Test for Tannin

Taken 10 ml of bromine water was added to the 0.5 g plant extracts. Decoloration of bromine water showed the presence of tannins.

2.4.7. Test for Saponin

Taken 5.0 ml of distilled water was mixed with plant extracts in a test tube and it was mixed vigorously. The frothing was mixed with few drops of olive oil and mixed vigorously and the foam appearance showed the presence of saponins [20].

2.4.8. Test for Glycoside

A solution of glacial acetic acid (4.0 ml) with 1 drop of 2.0% $FeCl_3$ mixture was mixed with the 10 ml plant extracts and 1 ml H_2SO_4 concentrated. A brown ring formed between the layers which showed the entity of cardiac steroidal glycosides [21].

2.4.9. Test for Phenols:

Taken 10ml of the extract was treated with few drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenol. Lead acetate test: 10 ml of the extract was treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of phenol [22].

2.4.10. Test for Quinone

About five ml of the extract was boiled with10% HCl for few minutes in a water bath. It was filtered and allowed to cool. Equal volume of Chloroform was added to the filtrate. Few drops of 10% ammonia was added to the mixture and heated. Formation of pink colour indicates the presence of anthraquinone[24].

3. 3. Results and Discussion

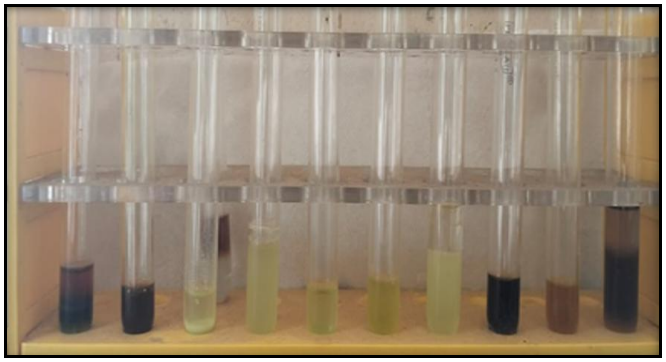
3.1. Phytochemical Analysis of aqueous tuber peel extracts of *Colocasia esculenta* and *Amorphophallus paeoniifolius.*

Table 1 and Fig.2. shows the Phytochemical Analysis *as* follows

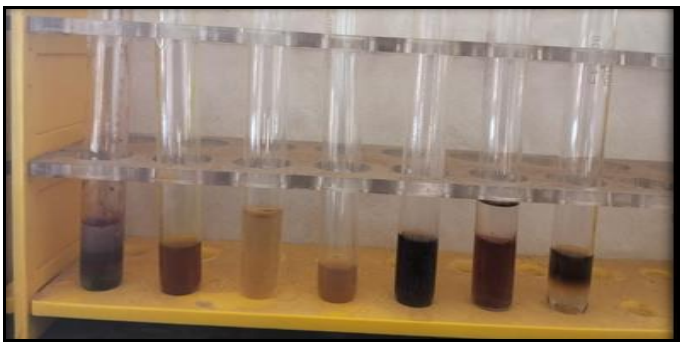
Phytochemical Constituents	Aqueous Extracts of	
	Colocasia esculenta	***Amorphophallus paeoniifolius***
Alkaloid	+	++
Flavonoid	++	+
Phenol	++	++
Tannin	++	+
Saponin	+	+
Glycoside	+	+
Terpenoid	+	++
Steroid	±	+
Protein	+	+
Carbohydrate	++	++

Indicated as: (+)-Present; (++)-Strongly Present; (±) – Trace present

The present investigation confirmed that the aqueous tuber peel extracts of *Colocasia esculenta* and *Amorphophallus paeoniifolius* contain various bioactive phytochemicals including alkaloids, flavonoids, phenols, tannins, saponins, glycosides, and terpenoids. The aqueous extract of *Colocasia esculenta* exhibited comparatively better antioxidant-related phytochemicals, whereas *Amorphophallus paeoniifolius* showed stronger alkaloid and terpenoid presence.



Colocasia esculenta



Amorphophallus paeoniifolius

Fig. 2. *Colocasia esculenta* and *Amorphophallus paeoniifolius*

The phytochemical screening revealed that both aqueous peel extracts contain several important secondary metabolites responsible for biological activities. The aqueous extract of *Colocasia esculenta* showed higher flavonoid, tannin, and phenolic contents, suggesting strong antioxidant activity. Flavonoids and phenolic compounds are known to act as free radical scavengers and reduce oxidative stress.

In comparison, the aqueous extract of *Amorphophallus paeoniifolius* exhibited relatively higher alkaloid and terpenoid content, which may contribute to antimicrobial and anti-inflammatory properties. The presence of saponins and glycosides in both extracts further indicates their medicinal importance. The study demonstrates that tuber peels, often considered waste materials, possess valuable phytochemicals that can be utilized in pharmaceutical

products, antioxidant formulations, and biodegradable composite film applications [25].

4. Conclusion

The present study successfully demonstrated the presence of various bioactive phytochemicals in the aqueous tuber peel extracts of *Colocasia esculenta* and *Amorphophallus paeoniifolius*. Preliminary phytochemical screening confirmed the occurrence of alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, terpenoids, proteins, carbohydrates, and steroids in both extracts. Among the two plants, the aqueous peel extract of *Colocasia esculenta* showed comparatively higher flavonoid, phenolic, and tannin contents, indicating stronger antioxidant potential, whereas *Amorphophallus paeoniifolius* exhibited relatively higher alkaloid and terpenoid content associated with antimicrobial and anti-inflammatory activities. The findings indicate that tuber peels, which are generally discarded as agricultural waste, contain valuable secondary metabolites with significant medicinal and industrial importance. Therefore, these aqueous peel extracts can be effectively utilized as natural sources of bioactive compounds in pharmaceutical formulations, antioxidant preparations, antimicrobial products, and biodegradable composite films. The study also emphasizes the importance of converting agricultural waste into eco-friendly and value-added materials for sustainable biomedical and packaging applications.

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Conflict of Interest: Nil

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