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Significance of Amorphophallus paeoniifolius inindigenous medical traditions

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ABSTRACT

This abstract delves into the phytopharmacological importance of *Amorphophallus paeoniifolius*, commonly known as the elephant foot yam, within the context of traditional medicinal practices. *A. paeoniifolius* has long been revered for its therapeutic properties and cultural significance in traditional medicine. This study aims to systematically explore and document the plant's phytochemical composition and pharmacological attributes, shedding light on its potential as a valuable resource in healthcare. The investigation involves a comprehensive review of the traditional uses of *A. paeoniifolius*, drawing upon indigenous knowledge and practices. Additionally, modern phytochemical analysis techniques, including chromatography and spectrometry, are employed to identify and quantify bioactive compounds present in the plant. These compounds, such as alkaloids, flavonoids, and terpenoids, contribute to the medicinal properties associated with *A. paeoniifolius.*The study also addresses the diverse therapeutic applications of the plant, encompassing anti- inflammatory, antioxidant, antimicrobial, and analgesic properties. Furthermore, the research explores potential mechanisms of action and evaluates the safety profile of *A. paeoniifolius*, laying the groundwork for its integration into contemporary healthcare practices. By bridging traditional wisdom with modern scientific methodologies, this study provides a comprehensive understanding of the phytopharmacological significance of *Amorphophallus paeoniifolius*, offering insights that may contribute to the development of novel therapeutic interventions rooted in traditional medicinal knowledge.

Keywords:

Phytopharmacology, Amorphophallus paeoniifolius, Traditional Medicinal, Elephant Foot Yam, Bioactive Compounds.

INTRODUCTION

Importance of herbal medicines In spite of great advances of modern scientific medicine, traditional medicine is still the primary form of treating diseases of majority of people in developing countries including India; even among those to whom western medicine is available, the number of people using one form or another of complementary of alternative medicine is rapidly increasing worldwide.

Increasing knowledge of metabolic processes and the effect of plants on human physiology has enlarged the range of applications of medicinal plants. According to the report by the World Bank in 1997, (technical paper number 355), it isapparent that the significance of plant-based medicines has been increasing all over the world. Nearly 50% of medicines in the market are made of natural basic materials. Interestingly, the market demand for medicinal herbs is likely to remain high because manyof the active ingredients in medicinal plants cannot yet be prepared synthetically. (Thomas SC, 1995)

The World health Organization (WHO) estimates that about 80% of the population living in the developing countries rely almost exclusively on traditional medicine for their primary healthcare needs. In almost all the traditional medical systems, the medicinal plants play a major role and constitute their backbone. Indian materia medica includes about 2000 drugs ofnatural origin almost all of which are derived from different traditional systems and folklore practices. Out of these drugs derived from traditional system, 400 are of mineral and animal origin while the rest are of the vegetable origin. India has a rich heritage of traditional medicine and the traditional health care system has been flourishing in many countries. Most recently, there has been interest in other products from traditional system of medicine Artemisinin is an active antimalarial compound isolated from Artimisia annua, a constituent of the Chinese antimalarial preparation Qinghaosu and forskolin was isolated from Coleus forskohlii, a species used in ayurvedic preparation for cardiac disorders. A new standardized preparation, artemether has recently been introduced for treatment of drug resistant malaria, and new analogues of forskolin are being tested for a variety of uses. Traditional medicine is an important part of healthcare. Population in developing countries depends mainly on the indigenous traditional medicine for their primary healthcare needs. Traditional medicineshave not however been incorporated in most national health systems and the potential of services provided by the traditional practitioners is far from being fully utilized. (Mukerjee PK, 2002)

Nutrition plays an important role in prevention of health conditions like increased illness, reduced quality of life and premature death as well as chronic diseases. Diet low in fibre and high in calories, fats, saturated fat, cholesterol and salts are associated with increased risk of coronary heart diseases, cancer, stroke, diabetes, obesity and pregnancy problems. We majorly rely on three major crops i.e. wheat, rice and maize for 60 % of the world’s calories. To secure our future, our crops need to evolve. Meeting the needs of the increasing population and ensuring everyone has access to affordable and nutritious food are major challenges to global agriculture. (FAO (2010a)

PLANT DESCRIPTION

Foods and medicines are the prime needs of human beings since primitive. Primitive human get these needs from wild. Land is limited and the population of world is increasing at alarming rate with modern life styles and anthropogenic activities leading food problems, disorders, anti-microbial resistance & novel microbial diseases. Hence, now we need nutraceutical from wild. Among the wild sources and contemporary health issues throughout the world, Amorphophallus paeoniifolius (Dennst.) Nicolson is right choice to study for getting future nutraceuticals and pharmaceuticals against food problems & novel infectious diseases like COVID-19. (Jugajyoti Swain *et. al*., 2022)

The word Amorphophallus is originated from “two Greek words”, amorphous means “irregularly shaped” and phallus means “male genital organ” thus giving the meaning “irregularly shaped penis”.

Figure 1: Total Plant A. Paeoniifolius

Figure 2: Leaves of A. Paeoniifolius

Figure 3: Corm of A. Paeoniifolius

METHODOLOGY

Collect plant materials

Amorphophallus paeoniifolius tubers were gathered from open spaces in the West Godavari District's Kovvur mandal. Corms with and without fine peel segments were scraped from the tuber, cleaned, and oven dried for 24 hours at 50°C. The dried sample was roughly powdered before being stored to test for antibacterial activity.

Preparation of plant extracts

Amorphophallus paeoniifolius Dennst Nicolson, often known as elephant foot yam, is a member of the Araceae family and was extensively collected from field regions in West Godavari. Foot yam corms were gathered and delivered to the lab in plastic bags. To remove any associated dirt and sand particles, each corm was carefully washed under running water. The final washings were then carried out using distilled water, and the corms were dried inthe shade. After being air-dried, the samples were ground into a coarse powder in a willey mill. Using a Soxhlet extractor, the coarsely ground material was weighed and extracted for five to six hours at a temperature below the boiling point of the solvent using hexane and methanol in consecutive order of polarity. 2ml of solvent was used for every gramme of dry material rotary evaporator is used. The obtained residue was referred to as a crude extract, and it was kept in a freezer at -200 C until it was time for a bioassay. The leftover corm extract was used to make different quantities of crude extracts (100 mg/ml, 150 mg/ml, 200 mg/ml, and 250 mg/ml), which were then filtered through a 0.45 m membrane filter and kept in sterile brown bottles in a freezer at -200C until bioassay.

Hydro-Alcoholic (70%) extraction

About 600 ml of 70% v/v hydro alcohol were used in a soxhlet extractor to thoroughly extract200 g of air dried corm powder per batch until the solvent in the thimble was clear. Later, Methodology 5 was the solvent from the filtered extract. At a temperature of 50°C, phytochemical investigation 105 evaporated off in a rotary vacuum evaporator. The resulting extract was desiccated over sodium sulphate to dry it out. A portion of the total extract was used for phytochemical research, while the remaining portion was used to estimate antioxidant levels in vitro.

Methanol Extraction

By employing methanol rather than hydroalcoholic, the above technique was used to create the methanolic extract. A portion of the total extract was used for phytochemical research, while the remaining portion was employed for antioxidant activity both in vitro and in vivo. The percentage of yield for each of the aforementioned extracts was computed in relation to an air-dried medication, and each extract's colour, aroma, and constituents were recorded.

Figure 4: Soxhlet Extraction

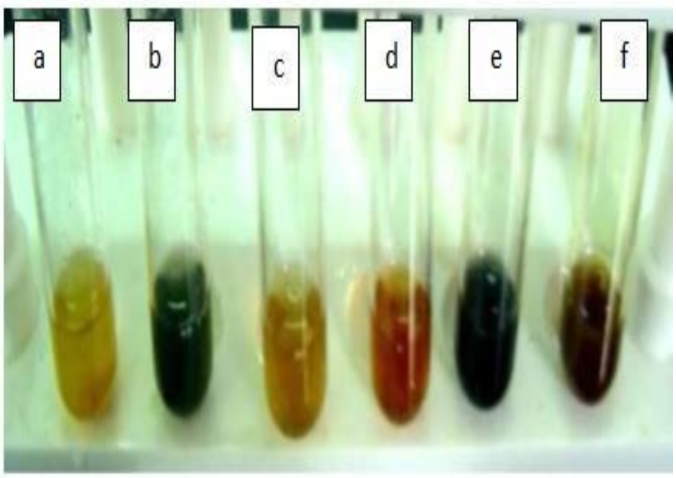

Figure 5: phytochemical analyses

Preliminary phytochemical investigations:

All the extracts of corm were subjected for systematic preliminary qualitative phytochemical investigations.

1. Tests for alkaloids
2. Tests for Tannins and Phenolic compounds
3. Tests for flavonoids
4. Tests for sterols: The extract was dissolved in chloroform, filtered and filtrate wastested for sterols.
5. Tests for Glycosides
6. Tests for Cyanogenetic glycosides
7. Coumarin glycosides
8. Tests for saponins
9. Tests for triterpenoids

10. Tests for Proteins
11. Tests for Amino acids
12. Tests for fats and fixed oils
13. Tests for carbohydrates
14. Tests for Gum and Mucilages
15. Tests for lactones
16. Tests for vitamins
17. In vitro Antibacterial Activity Assays

RESULT AND OBSERVATION

1. Phytochemical investigation

   By thorough soxhalation, two more extracts with high polar solvents—70% Hydro Alcoholic and Methanolic extracts—were created. Below are listed the yield percentages, colors, consistency, and smells of all of the aforementioned extracts.

Table 1: Percentage yield and physicochemical characters of various extracts of corms of *Amorphophallus paeoniifolius*

Extracts	**Colour and consistency**	**Odour**	**%w/w yield 70%**
Hydro Alc	Dark brownish powder	Agreeable	3.56
Methanol	Deep reddish brown powder	Pleasant	2.58
Petroleum ether	Light yellowish oily mass	Characteristic	1.05
Chloroform	Light brownish semisolid	Pleasant	0.23
Alcohol	Redish brown mass	Agreeable	2.45
Water	Dark brown sticky mass	Chard, Sugar	7.87

2. Phytochemical analysis of various extractPreliminary qualitative tests:

Table No. 2: Phytochemical Screening of Extracts of the Corm

Phytoconstituents	**AE**	**ME**	**Successive extraction**			
			P	**C**	**A**	**W**
Sterols	+	+	+ +	+	-	-
Saponins	-	-	-	-	-	-
Tannins	+ + +	+ + +	-	-	+	+
Flavonoids	+ +	+ +	-	-	+	-
Carbohydrates	+ +	+ +	-	-	+	+
Starch	+ +	+ +	-	-	-	+
Protein and amino acids	+ +	+	-	-	+	+
Alkaloids	+	+	-	+	+	-
Volatile oil	-	-	-	-	-	-
Fixed oil / Fat	+	+	+	-	-	-
Coumarins	+	+ +	-	-	+	-
Triterpenoids	+	+	+	-	+	-
Glycosides	-	-	-	-	-	-

Keywords: ‘-‘absent., ‘+’ presence, ‘++’ more clarity, ‘+++’ highly significant.
AE: 70 % Hydro Alc.extract ; ME : Methanolic extract ; P: Petroleum ether ; C :Chloroform; A: Alcohol ; W: Water

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The results obtained during the present investigation "Antimicrobial activityof *Amorphophallus paeoniifolius* (Dennst.) Nicolson" is presented under the following sections:

1. Sequential extraction of different tuber parts powder
2. Screening of Antibacterial and Antifungal Activity

Yield of the peel extracts

Amorphophallus paeoniifolius peel powder yielded the highest methanol extract (7.30g)followed by hexane (4.70g) (Figure 4)

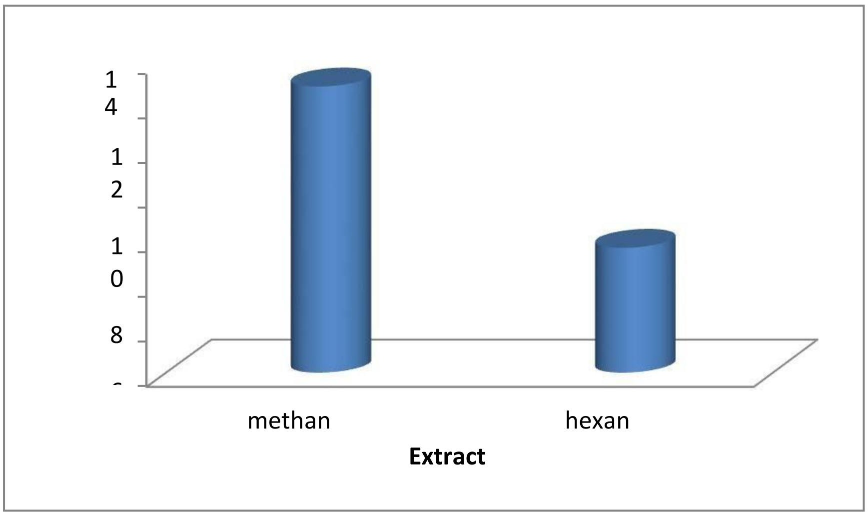

Figure 4: yield of the dried peel powder of *Amorphophallus paeoniifolius* with differentextracts

Yield of the corm without peel extracts

Amorphophallus paeoniifolius corm without peel, methanol extract was observed to have highest yield (Figure 5). Lowest yield was observed in hexane (2.22g) and it increased gradually up to methanol (8.43g). Yield increased with increase in the polarity of the solvents.

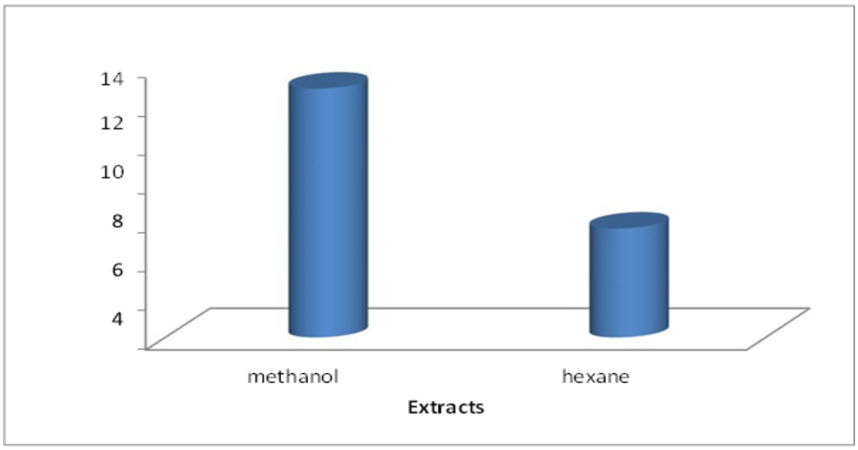

Figure 5: yield of the dried corm without peel powder of *Amorphophallus paeoniifolius* with different extracts

CONCLUSION

The public health risks brought on by bacterial infections have significantly lessened thanksto the discovery, development, and clinical application of antibiotics over the nineteenth century. The demand for new antibacterial compounds that are effective against harmful bacteria is rising as a result of the rise in bacterial resistance against current antibiotics.

The effective treatment of infectious disorders depends on the use of antimicrobial medicines.Despite the wide variety of drug classes that are frequently used to treat infections in people, pathogenic bacteria are continuously evolving drug resistance to these medications (Al-Bari*et al.*, 2006) as a result of the careless use of antibiotics (Gibbons, 1992; Rahman *et al*., 2001).

A significant portion of the population, particularly in underdeveloped nations where there isa reliance on traditional medicine for a multitude of diseases, has traditionally used higher plants and concoctions manufactured from them to treat infections. Due to contemporary issues involving antibiotics, interest in plants having antibacterial capabilities has surged (Emori and Gaynes, 1993; Pannuti and Grinbaum, 1995).Earlier this year, the antibacterial effects of various plant extracts against certain pathogens have been reported by a number of researchers (Ahmed and Beg2001; Erasto et al., 2004; Nair *et al.*, 2007b; Carneiro *et al*., 2008; Liasu and Ayandele 2008; Parekh and Chanda 2008; Chanda *et al*., 2009).

The goal of the current study is to evaluate the antibacterial effects of various crude extractsof chosen *amorphophallus paeoniifolius* corm sections in hexane and methanol against test bacterial and fungal species. It was found that the polarity of the solvent extracts affectedhow active they were; for example, corm parts extracted in hexane showed only mild activity compared to corm parts extracted in methanol, which showed moderate to strong antimicrobial activity. Additionally, it has been noted that activity is boosted with higher doselevels.

According to Peraman Muthukumaran *et al*. (2016), ethyl acetate extract has the highest levelof activity. According to Behera A et al. (2014), methanol extract has the greatest activity. According to Bhojane, ethanol extracts have good outcomes. P. *et al*., (2014). Benzene's efficacy was demonstrated by Krishnan R K et al. in 2001. Methanol extract reportedly produces great outcomes, according to Menghani E et al. (2014). According to Sayeed MA etal. (2014), strong inhibitory zones were found in methanol extracts. Extracts from ethanol exhibit useful action. Kadali VN and others, 2016.According to Krishna A. R. *et al*. (2013), petroleum ether extracts showed high activity. According to Nataraj H. N. *et al*. (2009), methanol has more antibacterial activity. According to Muthukumaran Peraman *et al.* (2017), aqueous extracts had the most activity.

According to the review of the aforementioned prior literature, we utilized hexane andmethanol as extraction solvents in the current investigation because hexane was very sparingly used by earlier researchers and methanol was shown to be superior to all other solvents. Numerous researchers have noted the antimicrobial properties of Amorphophallus paeoniifolius' peel, tuber, leaves, and roots in various solvent extracts.

The findings indicate that methanol extracts of the selected tuber sections produced a higher yield than hexane extracts. The gram-positive germs were clearly more susceptible to the tuber component extracts than the gram-negative pathogens. The single-layer cell wall structure of gram-positive bacteria may make them more susceptible than gram-negative bacteria, whose multi-layered cell walls are far more complex (Essawi and Srour, 2000). On the examined bacteria, two extracts displayed variable levels of antibiotic activity. Antibioticswere more effective than all of these extracts in treating.

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