

PHARMACOGNOSTIC AND PRELIMINARY PHYTOCHEMICAL SCREENING OF THE CORM OF AMORPHOPHALLUS PAEONIFOLIUS (DENNST) NICOLS .VAR PAEONIFOLIUS

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Received: 10 July 2012, Revised and Accepted: 14 Aug 2012

ABSTRACT

Amorphophallus paeonifolius (Dennst.) Nicols.var *paeonifolius* (*Kattuchena*) is a perennial erect herb with hemispherical underground corm consumed mainly for the treatment of piles by tribal population and also used for vitiated vata, kapha, hemorrhoids, hemorrhage, arthritis, inflammation, vomiting, cough, anorexia, amenorrhea, dysmenorrhea, sexual weakness and general debility. Total ash content, water soluble ash, acid insoluble ash, alcohol soluble extractive and water soluble extractive were found to be 9.16%, 4.86%, 3.66%, 5.36% and 8.36% respectively. The qualitative analysis of the powdered corms showed the presence of phytochemicals such as alkaloids, flavonoids, phenolic compounds, steroids, saponins. The element analysis showed the presence of maximum 699mg/gm of sodium and least value for magnesium (0.130mg/gm). The studies will help in the identification of the crude drug and for the development of monograph of the plant.

Keywords: *Amorphophallus paeonifolius*, nicols. var *paeonifolius*.

INTRODUCTION

The traditional Indian medicine is greatly valued for its therapeutic importance, yet due to the lack of stringent quality control, it is not well accepted by the modern system of medicine. We are sure that plants and plant based medicines are the basis of many of the modern pharmaceuticals we use today for various ailments. According to the WHO more than 80% of the World population relies on the traditional medicines for their primary health care needs. The value of medicinal plant is due to its active constituents, chemical substances. The knowledge of these chemicals would be valuable in discovering actual value of folkloric remedies. In addition to phytochemical studies, pharmacognostic studies like ash value, fluorescence characteristics, microscopic studies would help to standardization of medicinal plant which can reduce adulteration of plant part¹.

Amorphophallus paeonifolius (Dennst.) Nicols.var *paeonifolius* seen endemic to Western Ghats, is wild variety of chena commonly called *Kattuchena* belonging to the Family Araceae. It resembles to the cultivated variety *Amorphophallus paeonifolius* (Dennst.) Nicols. It is reported that the wild variety is consumed for the treatment of piles by Mullu Kuruma tribes of Wayanad District². *Amorphophallus paeonifolius* (Dennst.) Nicols.var *paeonifolius* is a perennial erect herb with hemispherical underground corm. Leaves compound, large, single, stout petioled, leaflets of variable size, male and female flower are in single inflorescence, covered with wide, pointed spathe; fruits berries, bright red when ripe, containing 2-3 small seeds. Plant pacifies vitiated vata, kapha, hemorrhoids, hemorrhage, arthritis, inflammation, vomiting, cough, anorexia, amenorrhea, dysmenorrhea, sexual weakness and general debility².

Literature survey showed that no phytochemical and pharmacognostical works has been carried out in this plant. Study presents pharmacognostical evaluation of corm of *Amorphophallus paeonifolius* (Dennst.) Nicols.var *paeonifolius*.

MATERIALS AND METHODS

The plant material, corm is collected from different parts of Thrissur District and identified and confirmed with the help of Gamble. Dust and debris were removed from the corm samples, dried at room temperature, stored properly in air tight container. The dried samples were then grinded to obtain coarse powder. Some rhizome samples were planted, propagated maintained in the campus garden.

Anatomical features of the fresh corm were studied using free hand section stained with Safranin and colour photographs were taken using the Trinocular photomicroscope (Labomed).

Physio-chemical standards, the ash and extractive values were determined as per the standard Indian Pharmacopoeia methods³.

Preliminary phytochemical screening of the rhizome powder for primary and secondary metabolites were conducted following the standard procedures^{4,5,6}.

The behavior of the powdered drug with different chemical reagents was also studied in day light short (254 nm) and long (365 nm) and ultraviolet radiations^{7,8}.

Analysis of ash for major elements is conducted by dissolving the sample in the mixture of 5ml of HNO₃ and 5ml of HCL and made up to 100ml using HPLC Grade Water. The filtered samples were analyzed with ICP-AES System⁹.

RESULTS AND DISCUSSION

Pharmacognostic techniques used in plant standardization include morphological, anatomical and biochemical characteristics [10,11]. The microscopic study of the corm shows superficial periderm, homogenous parenchyma with scaly vascular elements. The periderm consists of wide and distinct phellem and equally developed phelloderm. The phellem is wide and has thin walled suberised cells, the phelloderm consist of radially arranged rectangular thin walled cells. Inner to this, hexagonal cells were observed with dense starch deposition which forms the cortex. The starch grains are highly variable in size; but mostly they are circular concentric type. Small nest xylems are seen in thin radial chain. The middle portion of the tuber has small nests of vascular strands. The strand has one or two wide xylem elements and a cluster of small xylem elements. Phloem occurs in the outer portion of xylem strand (Fig 1).

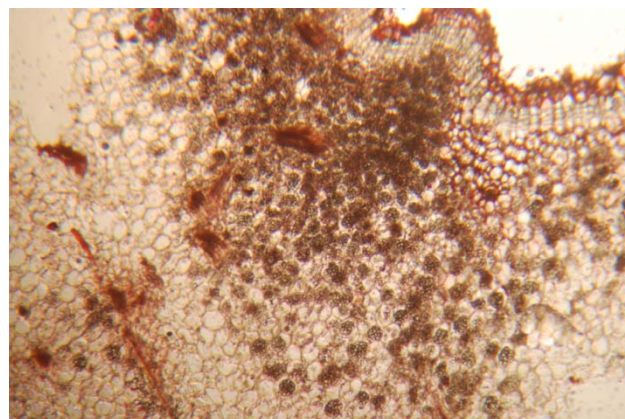


Fig. 1: Transverse section of the tuber of *Amorphophallus paeonifolius* (Dennst.) Nicols.var *paeonifolius*

The ash values, total ash, acid insoluble ash and water soluble ash are particularly important in the evaluation of purity of drugs¹². Total ash content, water soluble ash, acid insoluble ash, alcohol soluble extractive and water soluble extractive were found to be 9.16%, 4.86%, 3.66%, 5.36% and 8.36% respectively. Ash and extractive values signify the amount of inorganic impurities, resistant materials like sand, soil and stone particles in crude drugs. The ash value of medicinal plants reflects the carbonate, phosphates, oxides, silicates and silica¹³. Evaluation of ash and extractive values of crude drugs help in the identification and determination of its purity and quality¹⁴.

Phytochemical analysis is very useful in the evaluation of active biological components of medicinal plants. The qualitative analysis

of the powdered corms of *Amorphophallus paeonifolius* species showed the presence of phytochemicals such as alkaloids, flavonoids, phenolic compounds, steroids, saponins and the primary metabolites namely proteins, starch, carbohydrate (Table 1). Phytochemicals such as saponins, terpenoids, flavonoids, tannins, steroids and alkaloids have anti-inflammatory effects¹⁵. Presence of phenols indicates the plant ability for antimicrobial activities¹⁶. The good antioxidant activity and hypoglycemic activities can be attributed to the presence of flavonoids¹⁷. Alkaloids acts as an analgesic drug¹⁸. Alkaloids can increase nutrient absorption and blood circulation, hypoglycemic activities reduce pain and stimulate nerve system as it has narcotic effect¹⁹. Saponins helps in controlling cholesterol, antidiabetic properties²⁰. The steroids and saponins are responsible for central nervous system activities²¹.

Table 1: Preliminary screening of primary and secondary metabolites from *Amorphophallus paeonifolius* (Dennst.) Nicols. var *paeonifolius*

Primary/Secondary Metabolites	Name of the Test	Powdered tuber	Observations
Carbohydrates	Fehling Test	++	Red ppt
Starch	Iodine Test	+++	Blue colouration
Sugar	Antrone Reagent Test	+++	Blue Black Colouration
Proteins	Lowry's Method	++	Blue colouration
Aminoacids	Ninhydrin Test	-	No violet or purple colour
Fats	Filter paper Test	-	No oil stains on filter paper
Quinone	NaOH Test	-	No Red Colouration
Cardiac glycoside	Ferric Chloride Test	-	No green Blue ppt
Steroids	Liebermann-Burchard Test	++	Blue Green Ring
Flavonoids	Ethylacetate Test	++	Yellow colouration
Phenols	Folin Test	+++	Blue colouration
Saponins	Foam Test	++	Froth appearance
Alkaloids	Ammoniacal test	++	Creamish PPT

+ indicates the intensity of occurrence of the compound tested; - absence of metabolite

Table 2: Fluorescence analysis of powdered rhizome of *Amorphophallus paeonifolius* (Dennst.) Nicols. var *paeonifolius*.

Powdered Drug	Visible/Day light	UV 254 nm (Short)	UV 365 nm (LONG)
Powder as such	Light brown	Black	Black
Powder + 1M NaOH	Dark brown	Black	Dark blue
Powder + 1% Picric Acid	Light brown	Black	Dark blue
Powder + Acetic acid	Dark brown	Black	Grayish blue
Powder + 1M HCl	Dark brown	Black	Blackish blue
Powder + 5% Iodine	Creamish brown	Black	Dark blue
Powder + 5% FeCl ₃	Blackish brown	Black	black
Powder + HNO ₃ + 25% NH ₃	Dark brown	Black	Blackish blue
Powder + Methanol	Dark brown	Black	Dark blue
Powder + 50% HNO ₃	Yellowish brown	Black	Dark blue
Powder + 1M H ₂ SO ₄	Dark brown	Black	black
Powder + Conc HNO ₃	Blackish brown	Black	Dark blue
Powder + 10% potassium dichromate soln	Yellowish brown	Black	black
Powder + 25% Liquid NH ₃	Blackish brown	Black	Dark blue

Fluorescence analysis is the phenomenon exhibited by various chemical constituents present in the plant material under UV light (Table 2). This can be used to characterise the crude drugs. Thus crude drug is often assessed qualitatively and this forms an important parameter of pharmacognostical evaluation.

The data obtained for elemental concentrations of the plant tuber can be used to evaluate the potentiality of these in their medicinal preparations²². The analysis of element in the tuber (Table 3) indicated the presence of elements in the decreasing order with maximum value for Sodium and least value of Magnesium, Na > Fe > Sr > C > Mn > Cu > H > N > K > Ca > S > Mg. These elements play a vital role in the formation of secondary metabolites which are responsible for pharmacological actions of medicinal plants²³. Sodium and potassium form the major essential elements and is present in the plant tuber. Sodium is necessary in production of energy amino acid and glucose transport. A high concentration of sodium is seen in the tuber of *Amorphophallus*. Magnesium represents the element with least concentration. Magnesium

improves insulin sensitivity protect diabetes and its complications and reduce blood pressure.

Table 3: Elements analysis of rhizome of *Amorphophallus paeonifolius* (Dennst.) Nicols. var *paeonifolius*.

Elements	Mg/g
Nitrogen	2.48
Carbon	41.59
Sulphur	0.44
Hydrogen	6.11
Calcium	0.723
Pottassium	0.939
Magnesium	0.130
Copper	19.35
Iron	224.22
Manganese	23.1
Sodium	699.7
Strontium	70.4

Appreciable amount of manganese is found in the tubers. Manganese were found to be 28 mg/g of sample. Manganese deficiency causes skin damage anemia and hyper cholesterolemia²⁴. Mn helps to reduce fatigue and reduces nervous irritability²⁵. This plant can be used for medicinal preparations to supplement Mn for various body functions. Copper is an element actively involved in the synthesis of haemoglobin and thus play a vital role in the control of anaemia . 19 mg/g of copper is found in the tuber. Calcium which is essential element for life processes was found. Calcium overcome problems of high blood pressure ,heart attack premenstrual syndrome ,colon cancer and keeping the bones strong[23].K is helpful in reducing hypertension and maintaining cardiac rhythm. Fe forms an essential element to prevent anemia. In human body the elements play vital role in many physiological reactions and their deficiency or excess can effect human health²⁶.

The scientific investigation of traditional herbal remedies may provide valuable tool for the development of alternative drug and therapeutic strategies²⁷. The physicochemical parameters, preliminary phytochemical analysis, elemental analysis provide important information which may be help in authentication and adulteration for quality control of raw material.

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