

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

MANJU MADHAVAN<sup>1\*</sup> AND REGI RAPHAEL K<sup>2</sup>

<sup>1</sup>Manju Madhavan, Department of Botany, Vimala College, Thrissur, <sup>2</sup>Regi Raphael K, Department of Botany, St Mary's College, Thrissur, Email: manjugirish@sifymail.com

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 part<sup>1</sup>.

*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 District<sup>2</sup>. *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 debility<sup>2</sup>.

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 methods<sup>3</sup>.

Preliminary phytochemical screening of the rhizome powder for primary and secondary metabolites were conducted following the standard procedures<sup>4,5,6</sup>.

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<sup>7,8</sup>.

Analysis of ash for major elements is conducted by dissolving the sample in the mixture of 5ml of HNO<sub>3</sub> and 5ml of HCL and made up to 100ml using HPLC Grade Water. The filtered samples were analyzed with ICP-AES System<sup>9</sup>.

### 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).

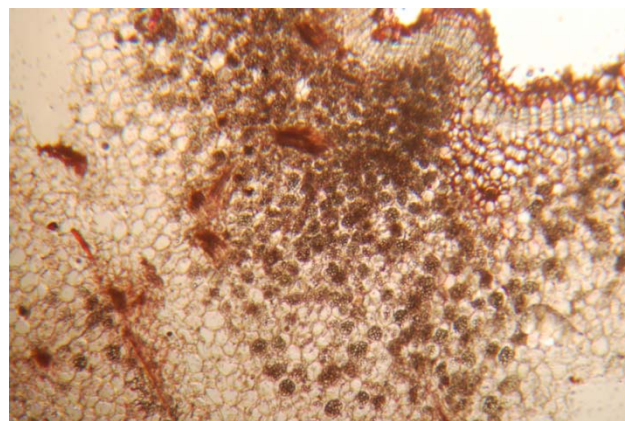


Fig. 1: Transverse section of the tuber of *Amorphophallus paeonifolius* (Dennst.) Nicols.var *paeonifolius*

The ash values, total ash, acid insoluble ash and water soluble ash are particularly important in the evaluation of purity of drugs<sup>12</sup>. 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 silica<sup>13</sup>. Evaluation of ash and extractive values of crude drugs help in the identification and determination of its purity and quality<sup>14</sup>.

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 effects<sup>15</sup>. Presence of phenols indicates the plant ability for antimicrobial activities<sup>16</sup>. The good antioxidant activity and hypoglycemic activities can be attributed to the presence of flavonoids<sup>17</sup>. Alkaloids acts as an analgesic drug<sup>18</sup>. Alkaloids can increase nutrient absorption and blood circulation, hypoglycemic activities reduce pain and stimulate nerve system as it has narcotic effect<sup>19</sup>. Saponins helps in controlling cholesterol, antidiabetic properties<sup>20</sup>. The steroids and saponins are responsible for central nervous system activities<sup>21</sup>.

**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 <sub>3</sub>	Blackish brown	Black	black
Powder + HNO <sub>3</sub> + 25% NH <sub>3</sub>	Dark brown	Black	Blackish blue
Powder + Methanol	Dark brown	Black	Dark blue
Powder + 50% HNO <sub>3</sub>	Yellowish brown	Black	Dark blue
Powder + 1M H <sub>2</sub> SO <sub>4</sub>	Dark brown	Black	black
Powder + Conc HNO <sub>3</sub>	Blackish brown	Black	Dark blue
Powder + 10% potassium dichromate soln	Yellowish brown	Black	black
Powder + 25% Liquid NH <sub>3</sub>	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 preparations<sup>22</sup>. 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 plants<sup>23</sup>. 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 cholesterolemia<sup>24</sup>. Mn helps to reduce fatigue and reduces nervous irritability<sup>25</sup>. 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 health<sup>26</sup>.

The scientific investigation of traditional herbal remedies may provide valuable tool for the development of alternative drug and therapeutic strategies<sup>27</sup>. 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.

#### REFERENCES

1. Abraham Z Glimpses of Indian Ethanobotany. Oxford &Publishing Co., New Delhi . 1981.308-320.
2. Silja VP, Samitha Varma K, Mohanan KV Ethanomedicinal plant knowledge of Mulla Kuruma tribe of Wayanad District of Kerala. Indian Journal of Traditional Knowledge. 2008; 7 (4):604-612.
3. Anonymous. India Pharmacopoeia Vol II, New Delhi, Controller of Publications Government of India . 1996.
4. Kokate CK, Pharmacognosy. 16th Edn., Nirali Prakasham, Mumbai, India. 2009.
5. Harborne JB, Phytochemical Methods. A guide to Modern Techniques of Plant Analysis. Champan &Hall. London. UK. 3 Ed. 1998.
6. Sadasivum, Manikam, Biochemical Methods. NewAge International(P)Limited. Publishers.2009.
7. Gupta MK, Sharma PK, Ansari SH, Lagarkha R, Pharmacognostical evaluation of Grewia asiatica fruits. Int. J Plant science. 2006 ;1 (2) :249-251.
8. Kokashi CJ, Kokashi RJ, Sharma M, Fluorescence of powdered vegetable drugs in ultra violet radiation. J. American Pharm. Assoc. 1958; 47:715-717.
9. Krachler M, Mohl C, Emons H, Shotyk, W, Spectrochim Acta. Part B. 2002; 57:1277-1289.
10. Pramod V Pattar Jayaraj M Pharmacognostical and phytochemical investigation of Sida cordifolia L.A threatened medicinal herb International Journal of Pharmacy and Pharmaceutical Sciences, 2011; 4(1): 114-117.
11. Ravichandra V D, Padmaa M Paarakh Pharmacognostic and Phytochemical investigation on leaves of Ficus hispida, International Journal of Pharmacy and Pharmaceutical Sciences 2011; 3( 2): 131-134.
12. Shruthi, SD, Ramachandra YL, Padmalatha, Rai S, Prashant Kumar Jha, *The Asian and Asian & Australasian J. Plant Sci. Biotech.* 2010;4(1). 62-65.
13. Bharat Gami, Arabia MH, Pharmacognostic evaluation of Bark and seeds of Mimosa elengi International Journal Pharmacy Pharmaceutical sciences. 2010;2.(4):110-113.
14. Kokate CK, Purohit AP, Gokhale SB, Pharmacognosy 45<sup>th</sup> Edition. Nirali prakashan, Mumbai India .2010.
15. Ilkay Orhan, Esra Kupeli, Bilge Sener, Erdem Yesilada, Appraisal of anti - inflammatory potential of the clubmoss, *Lycopodium clavatum* L. J. Ethnopharmacol. 2007; 109:146-150
16. Parekh Jigna, Sumitra Chanda V, Invitro antimicrobial activity and phytochemical analysis of some Indian medicinal plants. Turkish Journal of Biology. 2007;31.53-58.
17. Cherian S, Augusti KT, Insulin sparing action of leucopelargonidin derivative isolated from *Ficus bengalensis* Linn. Indian J. Exp. Biol, 1995;33: 608-611.
18. Cowan MM, Plant products as antimicrobial agents, Clinical Microbiology Reviews 1999;12(4):564-582.
19. Ong HC. Tumbuhan liar. Khasiat ubatan dan kegunaan lain. some Indian medicinal plants. J. Ethnopharmacol, 2004;19: 425-428.
20. Rupasinghe, HP, Jackson CJ, Poysa V, Di Berado C, Bewley JD, Jenkinson J, Soyasapogenol A and B distribution in Soybean (*Glycine Max L.Merr*) in relation to seed physiology, genetic variability and growing location. J. Agric. Food Chem, 2003;51: 5888-5894.
21. Argal A, Pathak AK, CNS activity of *Calotropis gigantea* roots. J. Ethnopharmacology. 2006;106: 142-145
22. Mamatha P, Sreevani P, Determination of sodium potassium chromium and Zinc in medicinal plants using instrumental neutron activation analysis (INAA). International Journal of Pharmaceutical Research and Development, 2011.3(7): 165-169.
23. Khan Kiran Yasmin, Mir Ajab Khan, Rabia Niamat, Mamoon Munir, Hina Fazal, Paras Mazari, Nighat Seema, Tasmia Bashir, Ammarah Kanwal, Sidra Nisar Ahmed. Element content analysis of plants of genus Ficus using atomic absorption spectrometer. African Journal of Pharmacy and Pharmacology. 2011, 5(3) :317-321.
24. Skenkin A, Clinical aspects of vitamin and trace element metabolism. Bailliere's Clin. Gastroenter, 1998; 2:765-798.
25. Djama AAD, Kouassi Goffri Mc, Koua AA, Ofosu FG, Aboh IJK, Trace elements analysis of some antiparasitic medicinal plants in Cote d'Ivoire using energy Dispersive X-ray Fluorescence (EDXRF) Technique. Current research Journal of Biological Sciences 2011;3(3): 209-215.
26. Ekinci N, Ekinci R, Polat R, Budak G, Analysis of trace elements in medicinal plants with energy dispersive X-ray fluorescence. J Radio anal Nuclear Chemistry, 2004;260:127.
27. Suriyavathana M, Usha V, Shanthanayaki M, Studies on phytochemical analysis and antioxidant activity of selected medicinal plants from kolli hills. Journal of Pharmacy Research, 2010; 3(2): 260-262.