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Pharmacognostic Study of the Seeds of *Artocarpus heterophyllus* Lam.

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Abstract

Artocarpus heterophyllus Lam. commonly known as Jackfruit is known to have high medicinal value. The present investigation deals with the pharmacognostic studies done on seeds of *Artocarpus heterophyllus* Lam. (Moraceae). The main aim of the study was to establish the pharmacognostic evaluation such as macro and micro parameters, physiochemical constants, moisture content, preliminary phytochemical analysis and quantitative estimation. The pharmacognostic studies reveal that the seeds of *Artocarpus heterophyllus* Lam. are potentially a rich source of phytochemicals that has high medicinal value and hence can be used as ethnomedicine.

Key words: *Artocarpus heterophyllus Lam., pharmacognostic, phytochemical profile*

Introduction

Plants play an essential role as the source of bioactive compounds. Medicinal plants serve directly or indirectly in the treatment of various diseases. It is been a conventional system, to use the plants and parts of plants by different tribal communities throughout the world for the treatment of various diseases as an Ethnomedicine since time immemorial. It is noted that in India the Human Traditional knowledge about the use of plants for Medicinal properties was documented in Rig-Veda, written around 4500 to 1600 BC and in Athar Veda, followed by Ayurveda and Unani system also documented a number of plants for its Medicinal properties (1).

The plants Medicinal property depends on the presence of the active principles and is also determined by the presence of the secondary metabolites such as alkaloids, amino acids, quinones, saponins, sterols and phenolic compounds synthesized naturally from the plants, known as bioactive non-nutrient compounds.

Medicinal plants play a major part not only directly in the field of pharmacological research and drug development but it also lay the basis for the synthesis of the drugs. This has gained interest in many countries in the recent years for use of medicinal plants as an alternative system of medicine. Thus, Herbal medicines play a key role in increasing and maintaining International Trade in both developed and developing countries, which increases the country's economic value from the products that are developed from medicinal plants. Every country has developed its own basic criteria to evaluate the safety, efficiency and quality of the Herbal drug developed (2) and micronutrient content (3).

***Artocarpus heterophyllus* Lam.** was analyzed for the pharmacognostic parameters such as powder microscopic analysis, physiochemical constants, preliminary phytochemical screening using different solvents, moisture content and quantitative analysis of Carbohydrates by anthrone method and proteins by Biuret method.

Objectives

Identification of the source of the material forming the drug.

Description of the plant morphology.

Investigation of its potency, purity and freedom from admixture.

Studying the constituents of the drug and investigating their physiochemical properties.

Materials and Methods

The fresh plant material *Artocarpus heterophyllus* Lam. was collected from the Shervaroy Hills, Salem district of Tamil Nadu.

The seeds of *Artocarpus heterophyllus* Lam. collected from the fresh fruit was shade dried and powdered into small fragments until uniform and smooth. The powder was subjected to successive Soxhlet extraction with different organic solvents to extract their active principles. The plant extracts were used for preliminary phytochemical screening.

Powder microscopic analysis plays a significant role in pharmacognosy for authentication of crude drugs and helps in the identification of appropriate variety.

The physiochemical parameters like Ash analysis and Extractive value were done following the methods of Ayurvedic pharmacopeia.

The phytochemical screening of a drug is very

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Table-1 : Ash analysis of *Artocarpus heterophyllus* Lam.

Type of ash	Percentage of Ash
Total Ash	3.5%
Water Soluble Ash	1.5%
Acid Insoluble Ash	1.23%

Table-2 : Extractive value of *Artocarpus heterophyllus* Lam.

Name of Solvent	Extractive value
Chloroform	1.6%
Petroleum Ether	0.8%
Ethanol	7.2%
Water	27.2%

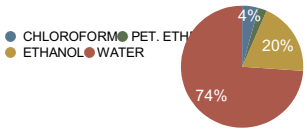

Fig-1: Extractive value of *Artocarpus heterophyllus* Lam.

important aspect in the process of standardization and quality control. Presence or absence of certain compounds in an extract is determined by the colour reactions of compounds with specific chemicals which acts as dyes.

Quantitative and qualitative estimation of carbohydrates by anthrone method and proteins by Biuret method.

Results and Discussion

Powder microscopic characters : The powder is whitish yellowish in colour, odor is fragrant, sweet in taste. Microscopic analysis of the powder revealed the presence of small vascular bundle in mesocarp; spiral thickening of xylem vessels; cotyledons of parenchymatous cells have simple and compound starch grains in endocarp; testa (Seed coat), tannin content.

Physiochemical constants (Ash values and extractive values) : The results of ash and extractive values of seeds of *Artocarpus heterophyllus* Lam. have been represented in table-1 and table-2. The physiochemical parameters are used to analyze the purity and quality of the extract. Ash value is important in evaluation of crude drugs. It is a criteria to determine the authenticity and purity of crude drugs or improper handling of drugs (4). The percentage of total ash in *Artocarpus heterophyllus* Lam. was 3.5%. The extractive value analysis is a valuable test to check the quality of drug as any variance in the chemical constituent may cause a change in the extractive value. It plays a major role in the evaluation of the crude drug (5). Less extractive value indicates addition of exhausted material, adulteration or incorrect processing during drying or storage or formulation (6). Thus it helps in determination of adulteration and is an index of the purity of the drug. The extractive value of water is more than in any other solvents investigated i.e., 27.2%.

Fluorescence analysis : The herbal drug can be used in powdered form and adulteration of the powdered drug is

Table-3 : Fluorescence analysis of *Artocarpus heterophyllus* Lam.

Sl. No.	Experiment	Visible Light	UV Light (365 nm)
1.	Powder as such	Brown	Brown
2.	Powder + 1N NaOH (Aqueous)	Red	Reddish brown
3.	Powder + 1N NaOH (Alcoholic)	Light yellow	Light brown
4.	Powder + 1N HCL	Light yellow	Light green
5.	Powder + Conc. H_2SO_4	Dark brown	Black
6.	Powder + 50%. H_2SO_4	Dark brown	Dark brown
7.	Powder + Conc. HNO_3	Yellow	Brown
8.	Powder + Conc. HCL	Orangish red	Dark red
9.	Powder + 50% HNO_3	Lime yellow	Brown
10.	Powder + 40% NaOH, 10% Lead acetate	Yellowish brown	Green
11.	Powder + Acetic acid	Whitish yellow	Light grey
12.	Powder + Ferric Chloride	Reddish brown	Dark brown
13.	Powder + HNO3 + NH3	Yellow	Dark green
14.	Powder + NH3	Light orange	Brown
15.	Powder + Benzene	Colourless	Colourless
16.	Powder + Petroleum Ether	Colourless	Colourless
17.	Powder + Acetone	Colourless	Colourless
18.	Powder + Chloroform	Light grey	Light orange
19.	Powder + Methanol	Yellow	Brown
20.	Powder + Ethanol	Light yellow	Light brown

very easy. Fluorescence analysis is one of the parameters used in pharmacognostic study where most of the phytochemical present in the sample gives respective fluorescent colour with different chemical agents. Fluorescence can be analyzed in both UV and visible light as it is the phenomenon exhibited in both visible as well as UV light by various chemical constituents which are present in the plant material. The results of fluorescence analysis of powdered seed sample of *Artocarpus heterophyllus* Lam. given in table-3. The powder showed yellow in Conc. HNO_3, methanol & HNO_3 + NH_3, light yellow in ethanol and 1N NaOH(Alcohol) &1N HCL, red in 1N NaOH (Aqueous), orange in NH_3 & Conc.HCL under visible light; brown in methanol, Conc. $HN0_3$, NH_3, 50% HNO3, reddish brown in 1N NaOH, dark red in Conc. HCL under UV light.

Preliminary phytochemical analysis : The phytochemical screening of the drug is a very important aspect in the process of standardization and quality control because the constituent varies qualitatively and quantitatively not only from plant to plant, but also in different samples of the same species. Presence or absence of certain phytochemical in an extract is determined by the colour retains of the compounds with a specific chemical. Preliminary phytochemical screening of four various extracts of the seeds of *Artocarpus heterophyllus* Lam. showed the presence of alkaloids, carbohydrates, coumarin, quinone, saponin, sugar, tannin, terpenoids and xanthoprotein. Thus, the plant sale was tested positive for as shown in table-4.

Table-4 : Preliminary phytochemical screening of *Artocarpus heterophyllus* Lam.

Test	Chloroform	Petroleum Ether	Ethanol	Water
Alkaloids	-	-	+	-
Anthraquinone	-	-	-	-
Catechin	-	-	-	-
Coumarin	-	-	-	+
Flavones	-	-	-	-
Phenol	-	-	-	-
Ouinone	-	-	+	+
Saponin	+	+	-	+
Tannin	-	+	+	+
Terpenoid	+	-	-	-
Xanthoprotein	+	-	-	+
Sugar	+	-	+	+
Carbohydrates	+	-	+	+

Moisture content : It is defined as the amount of water that can be removed without altering the chemical structure of the sample. The constant and changing drying coefficients are determined using gravimetric methods of measurement with a mathematical evaluation methodology.

Moisture content should be minimized in order to prevent decomposition of the crude drugs either due to chemical change or due to microbial contamination. It has a major impact in the quality and purity of the plant drug material. Moisture content of the seeds of *Artocarpus heterophyllus* Lam. was 66.8%.

Quantitative estimation of carbohydrates by Anthrone method : Carbohydrates are major energy source which provide many important nutrients is a monosaccharide which cannot be hydrolyzed further into simpler forms. The total carbohydrate content present in the seeds of *Artocarpus* heterophyllus Lam. was found to be 87.98 µg/m

Quantitative estimation of proteins by Biuret method: Proteins are nitrogen containing substances which are formed by amino acids and they serve as an essential structure component. The amount of protein in seeds of *Artocarpus heterophyllus* Lam. was found to be 83.88 µg/ml.

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