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RESEARCH ARTICLE

PTEROCARPUS MARSUPIUM: A PHYTOPHARMACOGNOSTIC STUDY

Mithun Mukherjee^{1*} and Sharmistha Gupta²

¹Ramakrishna Vivekananda Mission Institute of Advanced Studies Agarpara, Kolkata- 700058

²West Bengal State Council of Science and Technology, Salt Lake, Kolkata- 700091

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ABSTRACT

In the field of crude drugs the Phytopharmacognostical studies have a major role to in their quality control including proper identification. Although medicinal plants play a very significant role in the treatment of many diseases, their use is increasing day by day in our daily life. The present paper deals with the Phytopharmacognostical studies of the extracts obtained from the stem barks of *Pterocarpus marsupium* Roxb. comprising macroscopical, microscopical, phytochemical and physicochemical studies like loss on drying, extractive values, ash values amongst others. In this paper the study has been carried out keeping in mind standards as described in the Ayurvedic Pharmacopoeia of India.

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INTRODUCTION

Man has met all his needs from plants in terms of shelter, clothing, food, flavors and fragrances. The basis of systems among traditional medicine have been derived from plants which has given rise to some important drugs still in use today. A lot many of Countries have known the importance of herbal medicinal plants that brings more cure [Ashur A., 1986]. Existence of the plants and their use to treat diseases are as old as man. Dependability of man on plants has in no way decreased, although there are comprehensive documentations of the plants, used for their medicinal properties including parts such as leaves, stem and roots.

Decoctions of plants are used for the treatment of diseases such as diabetes, stroke, urinary problems, asthma, stomachache, hypertension, diarrhea and wounds [Anely. M, et al., 2007]. People have been using plants as a source of medicine since the beginning of human civilization perhaps as early as Neanderthal man, plants were believed to have healing power [Anna.K, 1993]. The traditional society across the world have always used herbs to promote healing [Okoli.R.I., et al 2007]. In today's world herbal medicine is the most predominant means of healthcare in developing countries where about 80% of their total population depends on it for their well being [Busmann R.G., et al 2006] [Akabue. P., 1982]. Plants form the basis of for the development of modern drugs and medicinal plants have been used for many years to treat disease all throughout the world in the daily course of life. [W.H.O, Programme on traditional medicines, 1991] [Patil.S.B., 2011] [Hamid. A.A., 2011].

World health organisation reports that 70% of populations from many countries use herbal medicines to cure various ailments. Since a long time plants have represented the only source of therapeutical agents known to man. Plants have

become the primary source of substances for drug development [Zaroni et al., 2004]. *Pterocarpus marsupium* Roxb commonly known as Pitasala or Bijasal belonging to the family of Fabaceae. The plant consists of the bark, leaves, heartwood. The plant is a moderate to a large deciduous tree growing to a height of 90 ft or more, commonly found in Central and peninsular India; found at 3000 ft in Gujarat, Madhya Pradesh and sub-Himalayan tracts. [Handbook of Ayurvedic Medicinal Plants Kapoor, L.D National Botanical Research Institute, Lucknow CSIR India, 276-277]. It grows on a variety of formations with good drainage preferring a soil with a fair proportion of sand, though It is often found on red loam with a certain amount of clay. The normal rainfall in its natural habitat ranges from 75 to 200 cm attaining its largest size in parts of Mysore and Kerala, where the rainfall is even higher. It is a moderate light demander and the young seedlings are sensitive to frost [A dictionary of Indian Raw Materials and Industrial products The Wealth of India, Vol VIII CSIR New Delhi, 303].

Its bark have been shown to contain tannins and gum kino containing kino tannic acid and 1-epicatechin [Ayurvedic Pharmacopoeia of India]. The bark of *Pterocarpus marsupium* Roxb. in the Indian Ayurvedic system of medicine is traditionally used as an anti-diabetic drug and the compound that is responsible for anti-diabetic activity is (-)epicatechin, a member of a group of compounds collectively known as catechins belonging to the class of flavonoids [Zaid et al., 2002]. Further administration of the bark extract to diabetic rats restored the levels of serum electrolytes, glycolytic enzymes and hepatic cytochrome p-450 dependent enzyme systems by inhibiting the formation of liver and kidney lipid peroxides [Gayathri and Kannabiran et al., 2010]. Also the methanol extract of the stem barks of *Pterocarpus marsupium* Roxb. have been shown to possess significant hepatoprotective activity [Mankani et al., 2005]. The whole aqueous extract of the stem bark of

Pterocarpus marsupium Roxb. showed high anti-oxidant activity and protects the mitochondria against oxidative damages [Mohammadi *et al.*, 2009].

Bark is also useful in vitiated condition of kapha, pitta, elephantiasis, erysipelas, Urethrorrhea, rectalgia, ophthalmopathy, hemorrhages, dysentery, cough, and grayness of hair [Patil and Gaikwad., 2011]. The powdered bark is mixed with *Schleichera oleosa* (Lour.) Oken and taken with cold water to treat dysentery [Mohanta *et al.*, 2006]. 20g of the stem bark boiled with 1 litre of water till it becomes 200ml along with 7 black pepper taken orally cures spermaturia, spermatorrhoea, leucorrhoea, amenorrhoea, dysmenorrhoea, menorrhagia and impotency [Behera S K and Mishra M K., 2005]. It has also been reported that *Pterocarpus marsupium* Roxb. bark extracts reduce the genotoxic effect of cyclophosphamide in a dose dependent manner which was comparable to a known anti mutagen, vitamin C. Thus this data clearly demonstrates that there are no genotoxic effects after administration of this drug in mice [Mahnaz M *et al.*, 2010]. The present article contains pharmacognostical, physicochemical and phytochemical evaluations of *Pterocarpus marsupium* Roxb. stem barks.

MATERIALS AND METHODS

Collection of Sample

Pterocarpus marsupium Roxb. stem barks were collected from Kolkata, locally and identified fig 1. Barks were collected in early summer when the cambium is active as it is easy to detach them from the stems. After collection the sample was dried in shade and the coarse powder of the bark was stored for their microscopical evaluation, phytochemical analysis, and physicochemical evaluations.



Figure 1 A twig of *Pterocarpus marsupium* Roxb.

Macromorphology

The entire stem bark of *Pterocarpus marsupium* Roxb. and its powder was evaluated for its organoleptic profile by observing its odour, colour, taste along with other properties as per standards specified in Ayurvedic Pharmacopoeia of India.

Cytomorphology

The transverse sections of the stem bark were taken, cleared with clearing agent and mounted in glycerine water. The

microscopic characters of the powders were studied for the evaluation of the various parts present in it. The detail cytomorphological structures were observed under microscope.

Preliminary Phytochemical Screening

The phytochemical evaluation of the stem barks of *Pterocarpus marsupium* Roxb. consists of qualitative chemical tests used for the identification of various phytoconstituents present in the *Pterocarpus marsupium* Roxb. bark extracts as has been described by [Kokate CK, Practical Pharmacognosy, 4th edition].

Physicochemical evaluation

Evaluation of crude drugs helps in its proper identification, further it also helps in fixing standards for the quality and purity of the drugs. The basic reason for the evaluation of a crude drug is the biochemical variation in the drug, effects of various treatments, storage of drugs along with the determination of adulterants and substituents [Jerald EE]. Phytopharmacopoeial standards for the crude drugs helps the quality control chemists to check verify and finally approve the materials for use. The various physicochemical parameters like, ash values, extractive values, loss on drying have been done strictly with respect to the standards specified in the Ayurvedic Pharmacopoeia of India.

RESULT AND DISCUSSION

Macromorphological Description

The morphological studies revealed the information about the size, shape and colour of the stem barks of *Pterocarpus marsupium* Roxb. The stem barks are 1-1.5 cm thick, channeled, yellowish brown to grey in colour as shown in figure 2., with thick brownish spots which are the result of exudations. The outer surfaces are found to be rough and uneven. Horizontal and longitudinal cracks are also seen, inner surface is smooth, fibrous fracture difficult to break, the taste is astringent, and odourless.



Figure 2 Stem barks of *Pterocarpus marsupium* Roxb.

Cytomorphological Description

Stem bark shows the presence of cells consisting of lysigenous cavities, present in a row just below cork. The secondary cortex is not distinct. Secondary phloem is found to

occupy almost two third of the thickness of bark consisting of sieve elements, phloem parenchyma. Parenchyma found collapsed towards the middle and outer regions of phloem. Phloem fibres single usually numerous in groups forming alternating bands throughout phloem region, thick-walled and lignified with a small lumen, rhomboidal crystals of calcium oxalate found scattered throughout the region, lysigenous cavities and tanniferous ducts filled with red colour masses distributed throughout phloem region are also seen. The results have been shown in the figures below. 3A, 3B and 3C reveals the transverse section of the stem. And figure 4A and 4B reveals the powder microscopy of the stem powder.

Physicochemical Parameters

The results of the physicochemical constants of raw material are found to be within the limits as specified in the Ayurvedic Pharmacopoeia of India is depicted in Table-2. Thus signifying that the quality and purity of the raw material was good enough. From the study the results of the ash value signify the purity of drug that is the presence or absence of foreign matter such as metallic salt or the presence of silica in the raw material, the result found is 1.4 ± 0.20 %. The total ash usually consists of carbonates, phosphates, silicates, and silica including both physiological and non-physiological ash, the

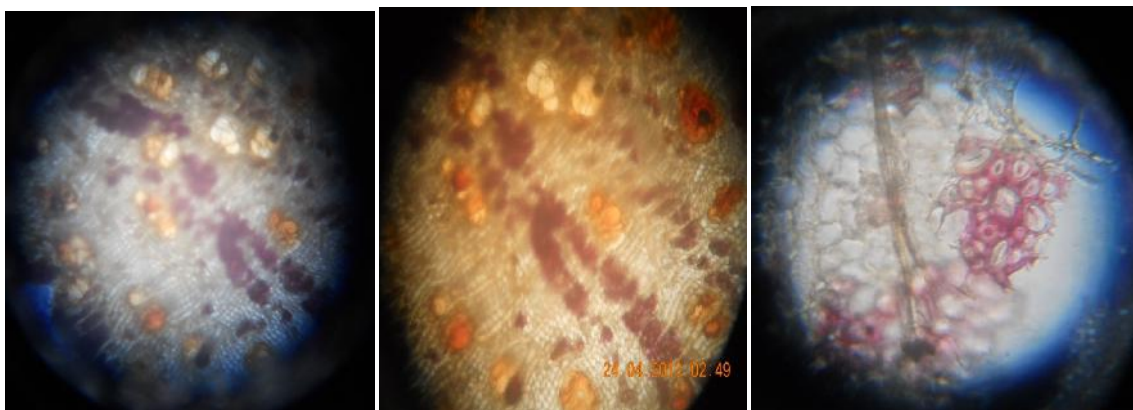


Figure 3 and 4 Transverse section of stem barks of *Pterocarpus marsupium* Roxb. Figure 5 Transverse section of the stems of *Pterocarpus marsupium* Roxb.

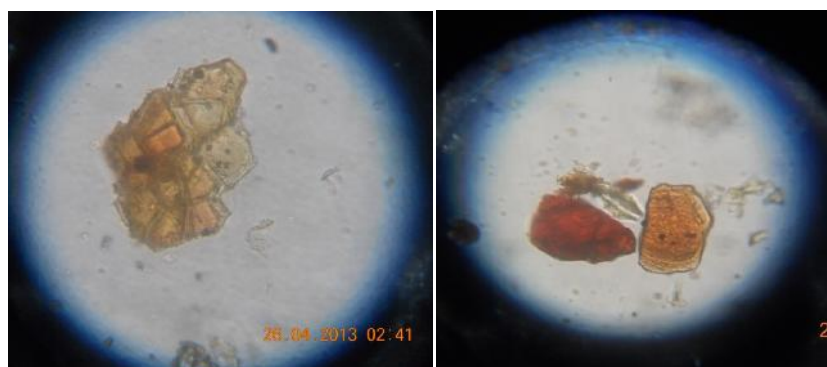


Figure 6 and 7 Powder Characteristics of stem barks of *Pterocarpus marsupium* Roxb.

Preliminary Phytochemical Screening

The preliminary phytochemical screening of the bark extracts of *Pterocarpus marsupium* Roxb were performed showing the presence of Phytosterols, Triterpenoids and Saponins in the petroleum ether fraction and Carbohydrates, Flavonoids, Tannins and Phenols in the methanol fraction. The results of the screening were expressed in Table-1.

Table 1 Preliminary Phytochemical Screening in different Extracts

Sr.No.	Petroleum ether	Benzene	Chloroform	Acetone	Methanol
Phytosterols	+	-	-	+	+
Triterpenoids	+	-	-	+	+
Saponins	+	-	-	-	+
Carbohydrates	-	-	-	-	+
Alkaloids	-	-	-	-	-
Flavonoids	-	-	-	-	+
Tannins and Phenols	-	-	-	-	+
Proteins	-	-	-	-	-
Amino acids	-	-	-	-	-

values in this case being 16.35 ± 0.23 % for total ash. Acid insoluble ash in general indicates the contamination of the plant with silicious materials like sand and earth comparing this with the total ash value of the sample helps in the differentiation between the contaminating materials and variations of the natural ash of the drug, in this case which was found to be 1.3 ± 0.34 %. The total soluble active constituents of the crude drug in any given solvent or solvent mixtures are determined by extractive values. The water soluble extractive was found to be 14.15 ± 0.32 % and the alcohol soluble extractive value was found to be 13.24 ± 0.26 %. All the results are within the limits specified in the

Table 2 Physicochemical Parameters

Sr.No.	Physicochemical Parameters	Values Obtained (% w/w)	Standard Values(% w/w)
1.	Foreign matter	1.4 ± 0.20	Not more than 2
2.	Total ash	16.35 ± 0.23	Not more than 18
3.	Acid insoluble ash	1.3 ± 0.34	Not more than 1.5
4.	Alcohol soluble extractive	13.24 ± 0.26	Not less than 7.5
5.	Water soluble extractive	14.15 ± 0.32	Not less than 11.5

Ayurvedic Pharmacopoeia of India.

CONCLUSION

Standardisation is an important measure for the quality, identification and purity. Macromorphological and Cytomorphological studies in association with quantitative analytical microscopy are considered one of the simplest and cheapest methods for establishing the correct identity of the source material. In this experiment the Physicochemical and qualitative chemical analysis of the stem barks of *Pterocarpus marsupium* Roxb. confirm the purity and quality of the crude material and identification. The information thus obtained can be further utilised for the Pharmacological and Therapeutical evaluation along with the standardisation of the plant material.

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