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Pharmacognostic evaluation of stem bark of *Pongamia pinnata* (L.) Pierre

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ABSTRACT

Objective: To perform the pharmacognostic study of *Pongamia pinnata* (L.) Pierre (*P. pinnata*) stem bark. Method: The pharmacognostic studies were carried out in terms of organoleptic, macroscopic, microscopic, fluorescence analysis and physicochemical parameters. Results: The bark consisting of channelled, recurved, slightly quilled, usually 0.2-1 cm thick, lenticellate pieces with outer surface ash-grey to greyish-brown and internal surface yellowish-white to cream coloured having unpleasant odour and bitter taste. The main microscopic characterstics of the bark include phellem (5-20 or more layers of cork), phellogen (2-3 layered) followed by 10-15 layered phelloderm. Among other microscopic components were phloem parenchyma, phloem fibre and stone cells, traversed by wavy medullary rays. Further, physicochemical analysis of the bark power showed total ash, water soluble ash, acid insoluble ash and sulphated ash as 10.94, 1.96, 1.47 and 15.8 % w/w respectively. The alcohol and water soluble extractives values of the stem bark were 9.6 and 18.4 %w/w respectively. Conclusions: Various pharmacognostic characters observed in this study helps in botanical identification and standardization of *P. pinnata* L. in crude form.

1. Introduction

Pongamia pinnata (L.) Pierre(*P. pinnata*) synonyms *Pongamia glabra* Vent. (*P. glabra*), *Derris indica* (Lam.) Bennett (*D. indica*), *Cystisus pinnatus* Lam. (*C. pinnatus*), *Millettia novo-guineensis* Kane & Hat(*M. novo-guineensis*) and *Millettia pinnata* (*M. pinnata*) (*P.)Panigrahi* (family Fabacae) popularly known as 'Karanj' in Hindi, Pongam in Tamil and 'Indian beech' in English, is native to India and widely distributed along Southeast Asia to the West Pacific and North Australia[1-4]. It is a medium-sized tree with a short crooked trunk and a broad crown of spreading or drooping branches. It is naturally distributed along the coasts and river banks in India and Myanmar[5].

Historically, *P. pinnata* is mentioned as folk medicinal plant, particularly in Ayurvedha and Siddha systems of Indian medicine for the treatment of abscess, bronchitis, diarrhea, itches, piles, skin diseases, tumors, painful rheumatic joints, ulcers, whooping cough and quench dipsia in diabetes[6,7]. Traditionally, *P. pinnata* is used in India as an antiseptic, blood purifier, to treat cuts and wounds[8]. The plant has been reported to possess anti-inflammatory, antioxidative, analgesic and antiulcer[9-11], antifungal, antibacterial[12] and antihyperglycaemic[13] activities etc. Various constituents isolated from the bark of this plant include seven flavonoids viz., pongaflavone, karanjin, pongapin, pongachromene, 3,7-Dimethoxy-3′,4′-methylenedioxyflavone, millettocalyxin C, 3,3′,4′,7-tetrame thoxyflavone[14], two prenylated flavonoid derivatives viz., pongaflavanol & tunicatachalcone[15], phenylpropanoids viz., Pongapinone A & B[16], cycloart-23-ene-3 β, 25-diol[17].

Due to its ethnopharmacological importance and the lack of studies on this native medicinal species, the present investigation was sought to perfrom the pharmacognostic study of stem bark of Pongamia pinnata (L.) Pierre, in order to develop pharmacopoeial standards and to contribute to the quality control of this potential plant drug.

2. Materials and methods

2.1. Chemicals

All the chemicals used were of analytical grade and

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were obtained from Rankem Limited India and Hi-Media laboratories, Mumbai, India.

2.2. Procurement of plant materials

Bark of the plant was collected from the campus of Kurukshetra University, Kurukshetra during April 2010 and authenticated by Dr. H.B Singh, NISCAIR under reference number (NISCAIR/RHMD/Consult/-2010-11/1471/69).

2.3. Macroscopic evaluation

Various organoleptic and macroscopic characters of Pongamia pinnata (L.) stem bark like colour, shape, size, tase odour, fracture and configuration etc. were studied[18].

2.4. Microscopic evaluation

In microscopic evaluation, studies were conducted on both grounds qualitatively and quantitatively. The model of microscope used for study of different characters was SKC-400, Suswox Optik, Sudheer Scientific Works, India.

2.4.1. Qualitative microscopy

In this study, transverse sections of stem bark were studied under photomicrograph. Staining reagents (such as phloroglucinol-HCl) were used as per standard procedures[19,20]. The various identifying features of the drug were studied with or without staining and recorded.

2.4.1.2. Stem bark microscopy

The stem bark was dipped in a test tube containing sufficient water and was boiled for few minutes. The softened bark was transversally sliced into fine sections which were subjected to staining reagent 0.1% w/v phloroglucinol followed by concentrated conc. hydrochloric acid. The stained sections were observed under microscope[21,22]. Different layers of cells and identifying characters were observed then photomicrography was done.

2.4.1.3. Powder microscopy

The dried stem bark was powdered and studied under microscope. Different staining reagents (such as iodine for detection of starch grains and phloroglucinol for detection of lignified components) were used. To a little quantity of stem bark powder taken over a microscopic slide, 1-2 drops of 0.1% w/v phloroglucinol solution and a drop of concentrated hydrochloric acid were added and covered with a cover slip. The slide preparation was mounted in glycerol and examined under microscope[23]. The characteristic structures and cell components were observed and their photographs were taken using photomicrography.

2.5. Fluorescence analysis

Fluorescence study of stem bark powder was performed as per reported standard procedure[24]. A small quantity of the bark powder was placed on a grease free clean microscopic slide and 1-2 drops of the freshly prepared reagent solution were added, mixed by gentle tilting the slide and waited for 1-2 minutes. Then the slide was placed inside the UV chamber and observed in visible light, short (254 nm) and long (365 nm) ultraviolet radiations. The colors observed by application of different reagents in different radiations were recorded.

2.6. Physicochemical analysis

In this study, Air dried material was used for quantitative determination of physiochemical values like loss on drying, total ash, acid insoluble ash, water soluble ash, sulphated ash values and extractive values were determined as per reported method[25].

3. Results

3.1. Macroscopic study of stem bark

Morphological examination of the stem bark shows that the bark consists of channelled, recurved, slightly quilled, usually 0.2-1 cm thick, lenticellate pieces, more or less smooth; outer surface ash-grey to greyish-brown and internal surface yellowish-white to cream coloured; fracture, short and fibrous, odour, unpleasant; taste, bitter.

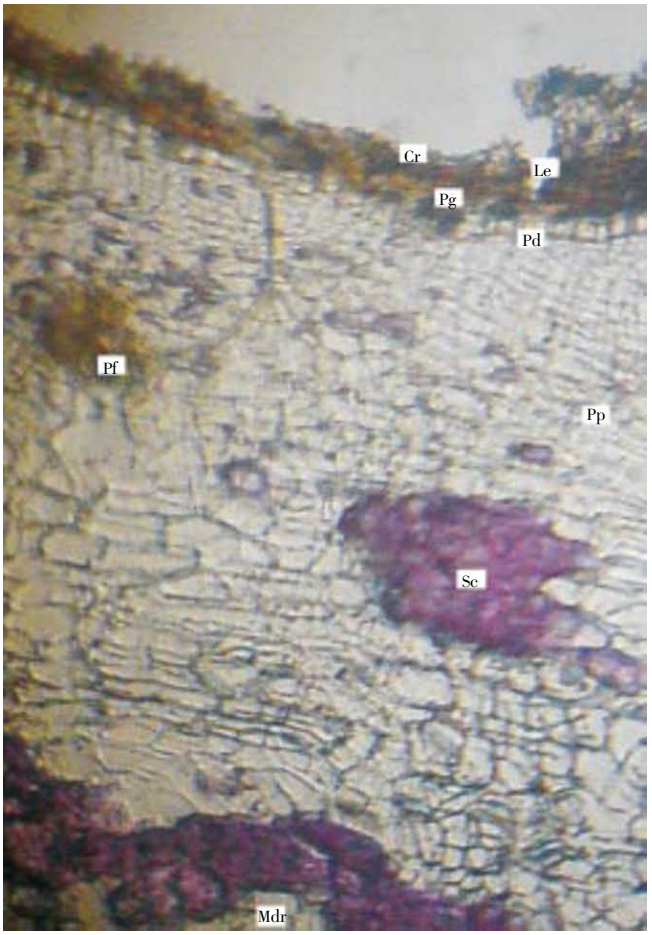

Figure 1. T.S. of of *P. pinnata* (L.) Pierre stem bark
Cr- cork (Phellem), Pg- Phellogen (Cork cambium), Le- Lenticels, Pd- Phelloderm (secondary cortex), Pf- Phloem fibre, Sc- Stone cells, Pp- Phloem parenchyma, Mdr- Medullary rays