Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 6, Suppl 1, 2014

Full Proceeding Paper

BOTANICAL STANDARDIZATION STUDIES ON *TAMARINDUS INDICA*-BARK

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Received: 06 Dec 2013, Revised and Accepted: 04 Jan 2014

ABSTRACT

Cinca tvak is bark of Tamarindus indica L. belonging to the family of Caesalpinioideae. This tree is cultivated in tropical, semitropical and arid regions of south India for its fruits and also grown as avenue tree in parks, roadsides, banks of rivers and lakes to prevent the soil erosion. The fruits are used in culinary purposes. The bark is used as astringent tonic, febrifuge, in sores, boils and rashes, asthma, eye inflammations, paralysis and indigestion. The stem bark contains several phytoconstituents like procyanidin, lupeol, saponins, sesquiterpenes, alkaloids, and phlobatannins.

INTRODUCTION

Bhasmas are traditional Ayurvedic preparations useful in treating various diseases and disorders. These are fine powders obtained from the original metal after subjecting to various purification and calcination processes. These purification and calcinations processes play vital role in converting the original toxic metal to non toxic and bio compatible form. Many plants play vital role in these processes and contribute significantly in converting these heavy metals to biocompatible nanomedicine Bhasmas which can help in alleviating diseases including cancer. The selected plant drug *Tarmarindus indica* L. is used as one of the purification agent in the special purification process involved in the purification of lead (Naga) in the preparation of Naga bhasma. Naga bhasma finds use in various diseases such as diarrhoea (*Atisara*), Malabsorption syndrome (*Grahani*), Abdominal lump (*Gulma*), Piles (*Arsa*) and in increased frequency and turbidity of urine (*Prameha*). This tree cultivated in tropical, subtropical and semiarid regions of India and South East Asia for its fruits and as an avenue tree [1]. Fruits of *T. indica* finds used as a culinary agents. Besides the bark of *Tamarindus indica* L. also finds use in eye inflammations [2] and its neuramidase activity [3] is also proven scientifically. The bark of the *T. indica* is used for treating asthma, indigestion, colic [2], febrifuge, sores, ulcers, boils, rashes, paralysis, gonorohea, urinary disorders [3], jaundice, and also used as skin cleanser [4]. The greatest lacuna existing in the herbal drugs is lack of proper scientific method of identification and authentication. Need of the hour is to determine botanical and chemical standards which can help in the identification and authentication of these plant drugs when they exist as fragments of bark or in powder form. Chemical characterization of *Tamarindus indica* L. revealed the presence of various bioactive molecules (in press). Hence in the present paper bark of *Tamarindus indica* L. which contributes in removing the toxicity of lead and also useful in inflammatory conditions and various diseases is studied from botanical standardization point of view and salient microscopic standards determined for this drug are presented and discussed, which could be useful in deciding the authenticity and genuiness of the drug if exists in dry and powdered condition.

MATERIAL AND METHODS

Chemical and Reagents

All chemicals and reagents used in the present study were of analytical grade and procured from Merck India Ltd, Mumbai.

Plant material

The stem bark of *Tamarindus indica* L. was collected from SASTRA University campus, SASTRA University, Thanjavur, Tamil nadu, India. The plant material was identified using the Flora of Preseidency of Madras [1]. Fresh bark was used for free hand sections and the dried stem barks were coarsely powdered and used for powder microscopy. Thin sections were made and subjected to microscopic characterization. The sections and powdered drug of the *T. indica* of the stem bark were treated with various chemical reagents like phloroglucinol and HCl, picric acid, Iodine potassium iodide solution, Chloral hydrate and sudan black B [2,3].

Compounds identification

Phytoconstituents of aqueous extract of selected plant was analyzed through LC/ESI/MS, Bruker UHPLC 3000 chromatography coupled to a quadrupole – ToF mass selective detector (micrOToF – QII).

Results and discussion

Macroscopic features

The macroscopic standards for the stem bark of *Tamarindus indica* L. have not been recorded anywhere including Ayurvedic Pharmacopoeia.

The thickness of the stem bark of *T. indica* is about 25mm, colour of bark is reddish brown and taste is astringent, odour charactristic, inner surface is cream in colour, irregularly fractured, texture is rough and hard (Table 1).

Table 1: Organoleptic Features of *Tamarindus indica* L.

Colour Outer surface	Colour innersurface	Texture	Fracture	Taste
Reddish brown	Cream	Rough and hard	Irregular	Astringent

Powder Microscopic analysis

The powder microscopic characterisation of *T. indica* revealed the presence of charactristic sclereids, group of stone cells; prismatic calcium oxalate crystals and lignified fibres with narrow lumen. (fig. 1).

T.S. of stem bark

This is the first report on the transverse section of the *T. indica* stem bark which revealed the presence of periderm consisting of thick walled tanniferous cells. Phelloderm consist of 4 – 6 layers of thin walled irregularly arranged parenchyma cells and groups

of distinct stone cells were also observed. Medullary rays are radially elongated, uniseriate to triseriate. The phloem region contain groups of phloem fibres and some of the phloem cells contain prismatic calcium oxalate crystals (fig. 2).

Phytoconstituents

Compounds present in *T. indica* aqueous extract were identified using LC-MSMS. MSMS fragmentation pattern were matched with in build library and online available MASS Bank website. Catechin and proanthocyanidin with various degree of polymerization were among the major compounds identified (Fig. 3).

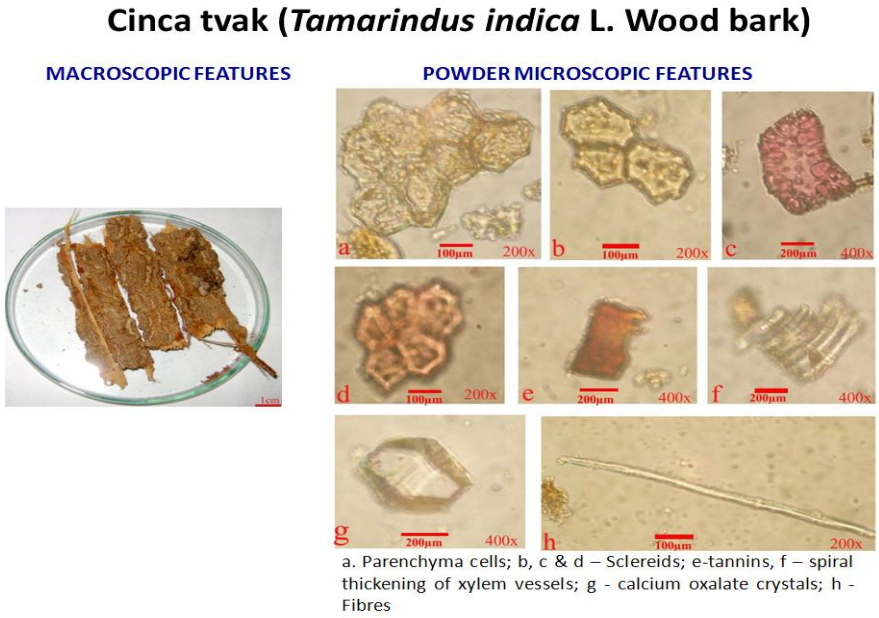


Fig. 1: Powder microscopic features of *T. indica* stem bark

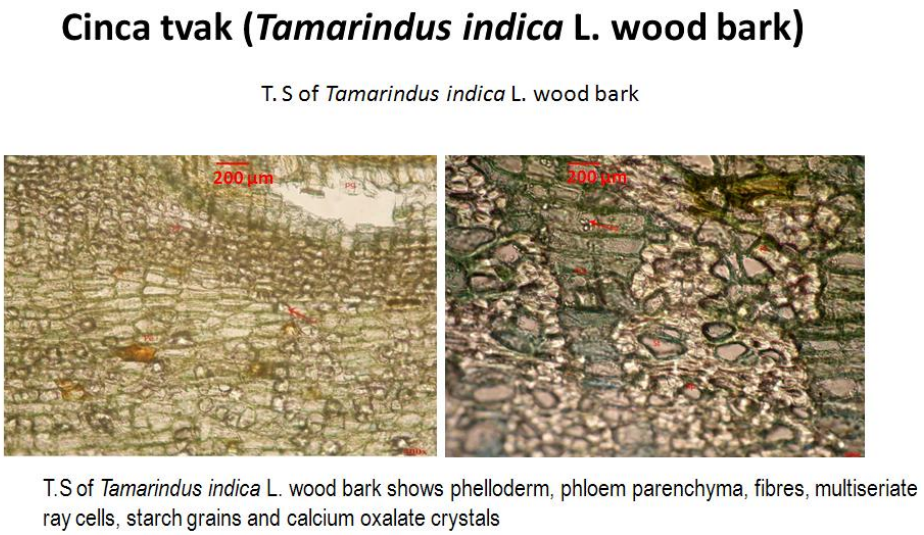
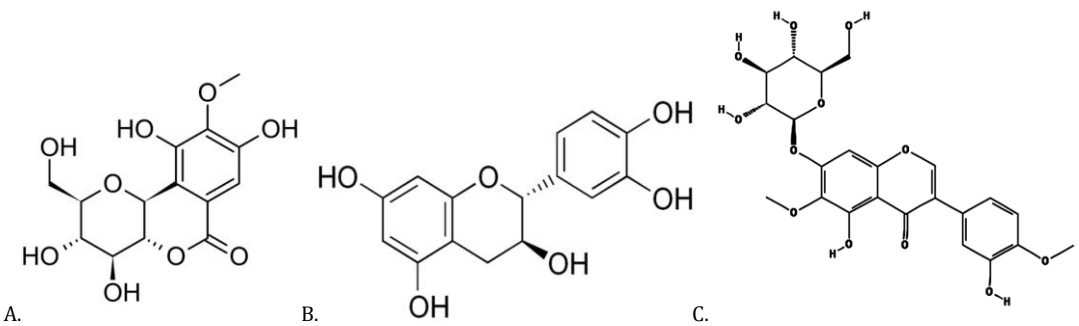


Fig. 2: T.S. section of *T. indica* stem bark



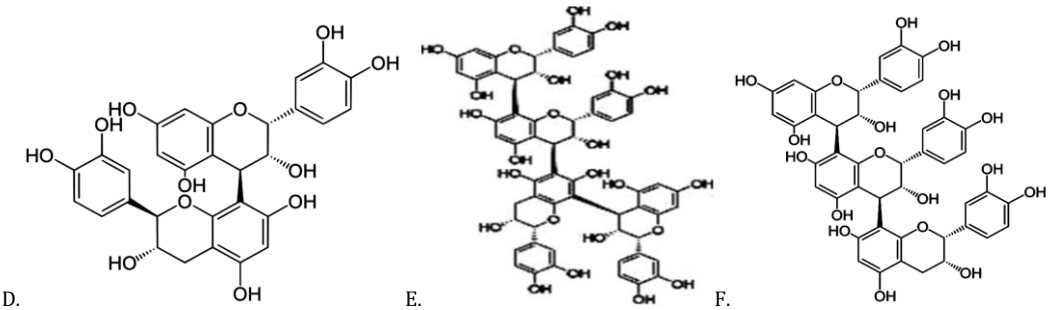


Fig. 3: Compounds identified in *T. indica* aqueous extract using LC-MSMS. A. Bergenin, B. Catechin, C. Iristectorin A, D. Proanthocyanidin B1, E. Procyanidin tetramer and F. Procyanidin trimer.

DISCUSSION

Tamarindus indica Lstem bark known as Cincka tvak in Ayurveda is studied from botanical and chemical standardization point of view. This tree is cultivated in tropical, subtropical and semiarid regions of India and South East Asia for its fruits and as an avenue tree. Fruits of *T. indica* used for culinary preparations and also used in traditional system of medicines for treating various ailments. The stem bark is used to treat asthma, digestive problems, skin problems, eye inflammations, jaundice, and yellow fever and also used as a skin cleanser, tonic and antibacterial agents. There is no work on record dealing with microscopical characterization of *T. indica* stem bark. This micromorphological standardization studies coupled with major phytoconstituents can help in identifying such bark drugs which are often used in the preparation and purification processes. Hence, in the present work stem bark of *T. indica* is studied from botanical standardization point of view. Organoleptic, macroscopic and microscopic studies which were carried out for the selected plant drug were presented and macro and micro-morphological standards determined were discussed. Macroscopically it is distinguished by reddish brown outer bark and astringent taste. Inner surface is cream in colour and irregularly fractured with rough and hard texture. Microscopically *T. indica* is characterized by the presence of distinct phelloderm, uni to multi seriate rays, groups of stone cells, lignified narrow fibre cells, prismatic calcium oxalate crystals and thick walled tanniferous cells. Chemically it is characterized mainly by the presence of Catechin and cyaniding molecules. Botanical and chemical standards determined in the present work could be useful in deciding the genuineness of this plant drug unequivocally.

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