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PHARMACOGNOSTIC EVALUATION OF *LAGERSTROEMIA SPECIOSA* FRUIT

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ABSTRACT: *Lagerstroemia speciosa* (Lythraceae), commonly known as Banaba which bears attractive and colourful pink or purple flowers. The leaf of the plant is used as a remedy for the treatment of diabetes. The seed, root, stem bark of the plant has shown a promising pharmacological effect. Fruits are used for diarrhoea, mouth ulcers. Pharmacognostic evaluation of leaves stems and stem bark is available in the literature; there are no reports available on pharmacognostic evaluation of fruit. The current study aims at the development of pharmacognostic standards for *Lagerstroemia speciosa* fruits. Fruits were evaluated for organoleptic, microscopic characteristics, physicochemical properties, preliminary phytochemical screening. Microscopy analyses showed pericarp, epidermal layer, mesocarp, endocarp, and seeds. Powder microscopy showed elongated sclerides, stone cells, fibers, parenchyma cells. Water and alcohol extractive values were found to be 13.2% and 0.96%, respectively. Preliminary phytochemical investigation of extracts showed the presence of tannins, flavonoids, and saponin. The current study would serve as an important tool for correct identification and preparation of monograph of *Lagerstroemia speciosa* fruit.

Medicinal plants have been used for treatment all around the world. They are important in various traditional medicine systems. The use of herbal medicines is ever-increasing. The herbal medicines market is also expanding globally. Hence the safety, efficacy and quality standardization of the medicinal plant-based drugs become essential [1, 2]. Microscopic identification and phytochemical investigation are the most commonly used economic methods for standardization, identification, authentication and assessment of qualities of crude drugs [3].

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In the current study, we have investigated *Lagerstroemia speciosa* fruit. The plant is commonly known as Banaba, Jarul, Queen's flower, Queen of flowers, Crepe myrtle and Pride of India [4, 5, 6, 7, 8]. Traditionally different parts of Banaba are used as a folk medicine for the treatment of different diseases. Tea prepared from leaves has been used to prevent diabetes mellitus [4, 8, 9, 10]. It is reported that the seed of banaba has narcotic properties.

The root is astringent with stimulant and febrifuge activity. Fruit is used for mouth ulcers. The fruit has proven antinociceptive and cytotoxic activity. Leaves are known for purgative action. Leaves also possess diuretic and antidiabetic action. At the same time, infusion of the bark is indicated in treating abdominal pain and diarrhea [7]. The detailed pharmacognostic evaluation of leaves stems and stem bark is available in literature [4, 5, 6].

However, microscopic evaluations and Pharma-cognostic study of the fruit of Banaba is not available in the literature. Hence in the present investigation the macroscopy, microscopy, physicochemical analysis as well as preliminary phytochemical analysis of fresh fruits as well as powder of fruits of Banaba was carried out to meet quality standards [11, 12].

MATERIALS AND METHODS:

Collection and Identification of Plant Material: The plant material was collected from medicinal plant garden of SNDT Women's University, Juhu Campus, Mumbai. For correct botanical identification herbarium of plant were made in flowering and fruiting condition. The herbarium is deposited and authentication was done from Agharkar Research Institute Pune Maharashtra.

Processing and Extraction of Samples: Fresh fruits were collected for microscopical analysis. The matured fruits were shade dried and crushed into coarse powder using mixer. The powder is further extracted with water and ethanol.

Macroscopic Evaluation: The morphological characters shape, sizes were determined. Organoleptic characters such as colour, odour and taste were noted. Other visible characteristics found for the fruit, seeds were also noted.

Microscopic Evaluation:

Transverse Section: The healthy fruit specimens were fixed in FAA [composition: formalin 5 ml, Acetic acid 5 ml, Ethyl alcohol (70%) 90 ml] and dehydrated using series of tertiary butyl alcohol [13, 14, 15].

Infiltration of dehydrated specimen was carried out using Paraffin wax (melting point 58-600 C) till tertiary butyl alcohol solution was supersaturated. Paraffin blocks were casted for the specimens. The sections of 10-12 µm were cut using rotary microtome and dewaxed for further staining procedure [14, 15, 16, 17]. Staining was done with Toluidine blue, safranin, Fast-green and iodine solution (for Starch) [14, 15, 17, 18].

Powder Microscopy: Thoroughly dried fruits were coarsely powdered and stained to observe different anatomical characters.

Nikon Lab photo 2 microscopic Unit was used to have photographs of different magnifications.

Physicochemical Evaluation: The physic-chemical standardization is one of the important tools for determination of adulteration and foreign organic matter. It is necessary to evaluate these parameters as the crude ingredients of herbal formulations are usually admixed with different adulterants. The different parameters such as loss on drying and total ash, acid-insoluble ash, extractive values were determined [19, 20].

Phytochemical Screening: The aqueous extract and ethanolic extracts of fruit prepared and screened for preliminary phytochemical constituents [20, 21].

RESULTS:

Identification and Authentication of Plant Material: The herbarium of plant is identified and authenticated from Agharkar Research Institute Pune Maharashtra. The plant authentication number is 3/187/2015/Adm.-2798.

Macroscopic Evaluation: *Lagerstroemia speciosa* is a tall tree. It can grow up to a height 20 to 22 m. It starts bearing flowers while it is shrub. The flowers are bright pink to purple in colour. The diameter of flowers is from 5 to 6 cm. Leaves are oblong in shape with a length of 11 to 25 cm and a width of 6 to 11 cm. The Colour of mature leaves is green, which turns orange to red as it gets older. The plant has smooth creamy-brown bark. It peels in flakes **Fig. 1.**

FIG. 1: *LAGERSTROEMIA SPECIOSA* PLANT IN FRUITING STAGE

Fresh fruits are green to olive green in colour; ripe fruits turn brown and then almost black. Fruits are smooth woody capsules. The seeds are apically wing. The size of the fruit is about 2 cm long with a spike at the tip **Fig. 2**.

The fruit has five sepals which are united at the base. A capsule of fruit splits open along five or six sutures and has neatly packed seeds inside **Fig. 3**.

Old woody fruits remain for a long time on the tree, even until the next flowering and fruiting season. Inside the fruit occurs thin flat seeds with a wing at its tip to facilitate dispersal by wind.

FIG. 2: SINGLE FRUIT SHOWING PERSISTENT CALYX LOBE AND REMAINS OF STAMEN CA: CALYX, FR: FRUIT

FIG. 3: LONGITUDINAL SECTION OF FRUIT

Qualitative Microscopy

Transverse Section of Fruit: When fruit is cut transversely, it shows six carpels. These six septa extend from the center towards the periphery. **Fig. 4** the pericarp of fruit is 2 mm thick. The pericarp consists of an epidermal layer, thick mesocarp and sclerotic endocarp. **Fig. 5** and **6** the epicarp consists of endoderm, parenchymal cells, and periderm of the pericarp. The mesocarp is the middle part of pericarp, consisting of parenchyma cells, wide circular mucilage-containing cells, and small circular vascular bundles. Inner part of pericarp has fibers **Fig. 6**. Seeds are covered with soft cottony wool on the surface. The seeds have a narrow conical stalk and wide triangular outer part **Fig. 7.**

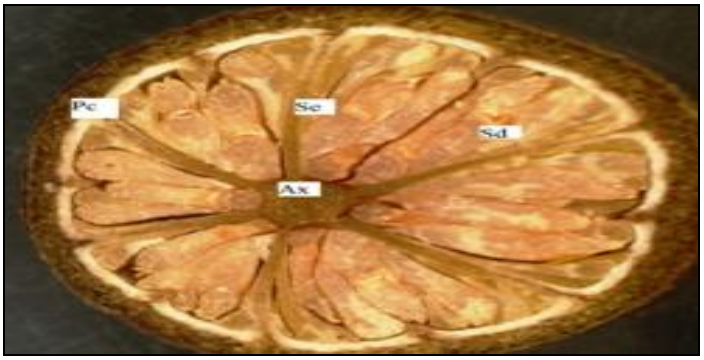

FIG. 4: TRANSVERSE SECTION OF FRUIT (LOW MAGNIFICATION). Ax- Axis, Se: Septum, Sd: Seed, Pc: Pericarp.

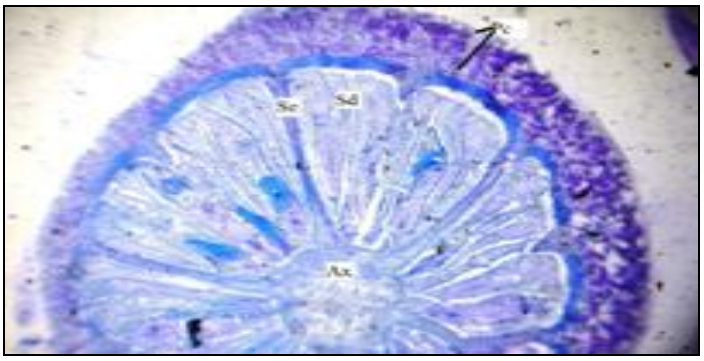

FIG. 5: TRANSVERSE SECTION OF FRUIT (HIGH MAGNIFICATION). Ax- Axis, Se: Septum, Sd: Seed, Pc: PericarpTS show fertile seeds.

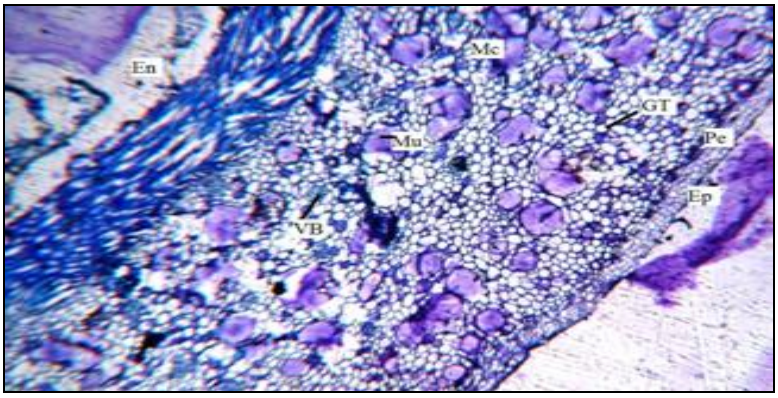

FIG. 6: T. S. OF FRUIT-PERICARP PORTION. Ep: epicarp, En: Endocarp, GT: Ground Tissue of mesocarp, Me: Mesocarp, Mu: Mucilage containing cells, VB: Vascular Bundles.

FIG. 7: SEEDS- ENTIRE VIEW

Powder Microscopy: The powder of fruit is brown to black in colour and has a characteristic odour and taste. The powder characteristics include sclerenchymatous pericarp, thick cylindrical elongated sclerides, rectangular stone cells, long narrow tapering fibres, rectangular and conical shape parenchyma cells, plenty of rosette type calcium oxalate crystals **Fig. 8 A-F**.

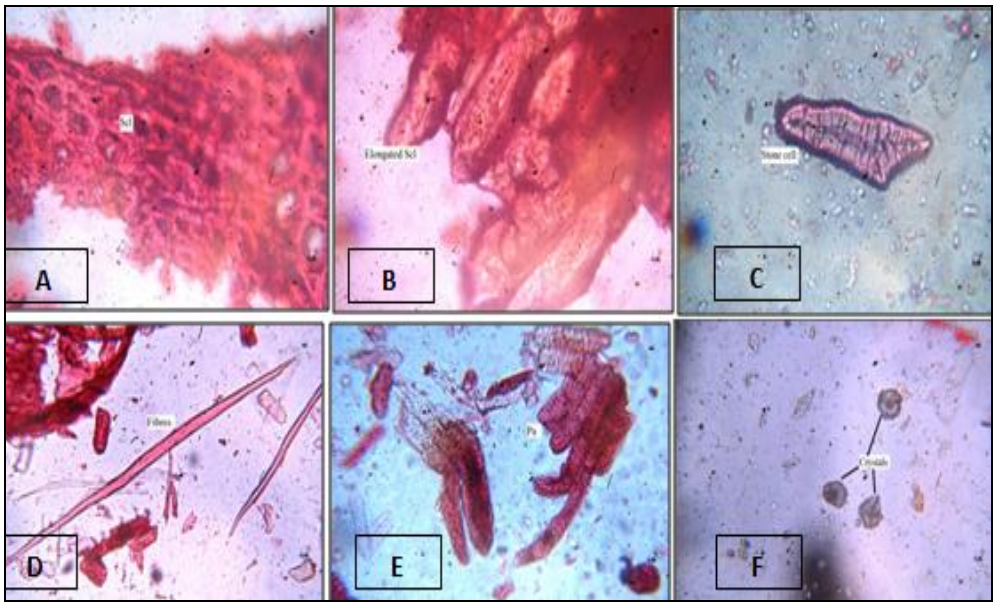

FIG. 8: PHOTOMICROSCOPY OF POWDER OF *LAGERSTROEMIA SPECIOSA* FRUIT.

A: sclerenchymatous pericarp, B: thick cylindrical elongated sclerides, C: rectangular stone cells. D: long narrow tapering fibres, E: rectangular and conical shape parenchyma cells, F: rosette type calcium oxalate crystals.

Physicochemical Evaluation: The loss on drying at 1100 is found to be 21.2%.

TABLE 1: PHYSICOCHEMICAL ANALYSIS OF *LAGERSTROEMIA SPECIOSA* FRUIT

S. no.	Parameters	Result (%)
1	LOD at 105°C	21.2
2	Total Ash	27.7
3	Acid insoluble Ash	9.08
4	Water soluble extractive	13.2
5	Ethanol soluble extractive	0.96

Total ash value was found 27.7% and acid insoluble ash was found 9.08%, respectively.

The water-soluble, as well as ethanol soluble extractive values, is **Table 1.**

Phytochemical Screening: Water and ethanol extract of fruit showed the presence of tannins, flavonoids, saponins glycosides. Steroids and alkaloids were found to be absent **Table 2**. Flavonoids and tannins are well known for their therapeutic importance. The plant possesses a high percentage of tannins, flavonoids; hence the fruit may show promising pharmacological action.

TABLE 2: PRELIMINARY PHYTOCHEMICAL INVESTIGATION OF EXTRACTS OF *LAGERSTROEMIA SPECIOSA* FRUIT

Reagent	Functional Group	Observation		Result	
		Aqueous extract of powder of dried fruits	Alcoholic extract of powder of dried fruits	Aqueous extract of powder of dried fruits	Alcoholic extract of powder of dried fruits
Molisch's reagent	Carbohydrates	No ring formation	No ring formation	Absent	Absent
Dil. $FeCl_3$	Phenols	Change in colour to reddish-brown	Change in colour to reddish-brown	Present	Present
Neutral $FeCl_3$	Tannins	Change in colour to dark brown	Change in colour to dark brown	Present	Present
Shinoda test	Flavanoids	Reddish colour	Reddish colour	Present	Present
Dragendorff's reagent	Alkaloids	No colour change	No colour change	Absent	Absent
Frothing test	Saponin Glycosides	Formation of a stable froth	Formation of a stable froth	Present	Present
Liebermann burchard test	Steroids	No colour change	No colour change	Absent	Absent

DISCUSSION: Pharmacognostic evaluation is an important tool for the identification of medicinal plants. It is rapid, easy and economical. Microscopic evaluation is one of the essential parameters in the monograph of the plant. Studies on physicochemical constants can serve as a vital source of information for quality control of the crude drug. Pharmacognostic and physicochemical evaluation can serve as a primary yet reliable tool for identifying the crude drug.

Gross identification can be done by morphological characters like colour, odour, taste, *etc*. From the results of microscopical characters, the fruit microscopy showed six carpels, epidermal layer, mesocarp, endocarp and seeds. The powder microscopy showed elongated sclerides, stone cells, fibers, and parenchyma cells. Identification and authentication of the plant can be done by powder study. To establish identity and degree of purity, macroscopic and microscopic examination plays an important step as per WHO guidelines. The preliminary phytochemical analysis for both extracts predominantly showed the presence of tannins, phenols, flavonoids and saponins. Tannins, phenols, and flavonoids are usually considered as one of the important phytoconstituents. Phenolics and flavonoids as they serve as neutraceutical, pharmaceutical.

These phytochemicals have proven potent anti-oxidant, anti-inflammatory, anti-carcinogenic and anti-mutagenic activity [22, 23]. These secondary metabolites from plant resources have been used extensively for their therapeutic application and for the better health status of human beings [23]. The Pharmacognostic standards provide value-added information about the plant. These microscopic and macroscopic parameters will help establish the pharmacognostic standards [24].

The parameters reported for *Lagerstroemia speciosa* fruit in the current study will also be useful for the identification and authentication of the plant.

CONCLUSION: The present study will provide useful information for the correct identification, purity and standardization of plants.

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CONFLICTS OF INTEREST: Nil

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