

Pharmacognostic Evaluation of *Root of Albizia lebbbeck* (Linn.) Benth

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ABSTRACT

Aim: To develop the Pharmacognostic quality standard of root of *Albizia lebbbeck* (Linn.) Benth. Materials and Methods: Detailed macroscopy, microscopy, histochemical tests, fluorescence analysis, behaviour of powdered drug with different chemical reagents were performed for pharmacognostic evaluation of root of *Albizia lebbbeck* (Linn.) Benth. Results: Root showed presence of cork, cortex, cambium, xylem, phloem, starch grains and stone cells. Histochemical tests, behaviour of drug with different chemical reagents and fluorescence analysis showed the presence of lignin, starch, crystals which would proved to be a unique parameters for identification of the drug. Conclusion: Findings of this study will be helpful for identification and authentication of root of *Albizia lebbbeck* (Linn.) Benth.

Keyword: Sirisha, *Albizia lebbbeck*, Fluorescence, Histochemical, Microscopy.

INTRODUCTION

Albizia lebbbeck (Linn.) Benth. is a large, erect, deciduous tree found all over India. It belongs to family Fabaceae.^{1,2} Root is reported to possess lupeol, stigmaterol, 4-hydroxy-3-methoxycinnamic acid trans-*p*-coumaric acid, echinocystic acid, lebbeksterone, Isotriacontanol, tricosanyloctadec-9-en-1-oate and pentacosanyloctadec-9-en-1-oate³. It is reported that root alleviate spasms and stimulate the cardiovascular system; besides having anticancer and spermicidal properties.⁴ It is also used in hemicranias in the form of nasya. It is also prescribed as antihelminthic and used in rat bite.⁵ Literature search revealed that there are not a single report on pharmacognostic evaluation of root. Therefore detailed study on pharmacognostic standardisation of root was undertaken as per the standards/guidelines of API and WHO for medicinal plants.

MATERIAL AND METHODS

Plant material

Root of *Albizia lebbbeck* (Linn) Benth. was collected from the plant growing in the campus of Regional Ayurveda Institute for Fundamental Research, Pune, Maharashtra, India.

Identification and authentication of plant material

Plant material was identified and authenticated with the help of the Flora.⁶ Plant material was also compared with the herbarium specimen available in the herbarium section of the Institute.

Preparation of herbarium

Herbarium of the plant specimen were prepared and deposited in the herbarium section of the RAIFR, Pune with voucher specimen number 2298.⁷

Powder preparation

Shade dried root pieces was made in to powder using grinding mill; passed through #60 sieve and kept in airtight container for further analysis.⁸

Macroscopic characterization

Macroscopic characters like external features, fracture, shape, size, colour, taste, odour of root was determined.^{9,10}

Microscopic characterization

Free hand sections (T.S.) of root was taken and stained with Safranin and Phloroglucinol, followed by Hydrochloric acid. Micro photographs were snapped with the help of Deno Capture 2.0 version 142D, the versatile digital microscope.¹¹

Histochemical and fluorescence analysis

Dried root powder was used for the analysis of Histochemical, physico-chemical such as behaviour of powder, fluorescence analysis.^{12,13}

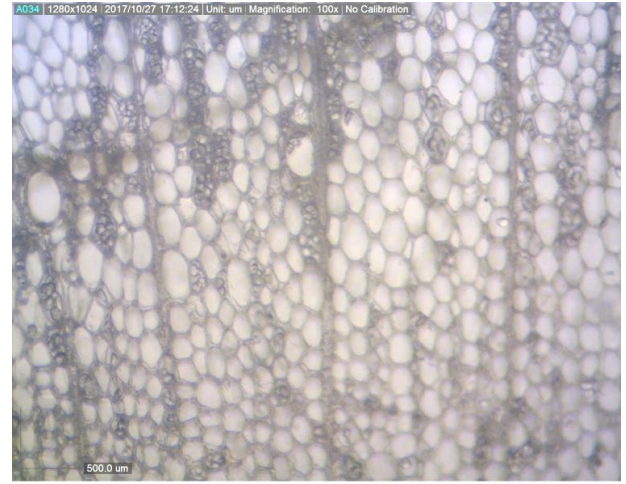
Determination of physicochemical parameters



Figure 1: Root of *Albizia lebbbeck* (Linn) Benth



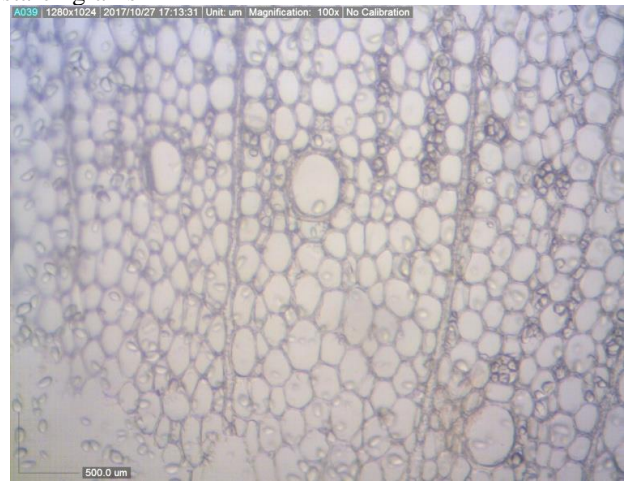
TS showing Cork and Cortex



TS showing xylem region, medullary rays, vessels and starch grains



TS showing Phloem region



TS showing inner xylem region, medullary rays, vessels and starch grains



TS showing Cambium joining phloem and xylem



TS showing inner xylem region

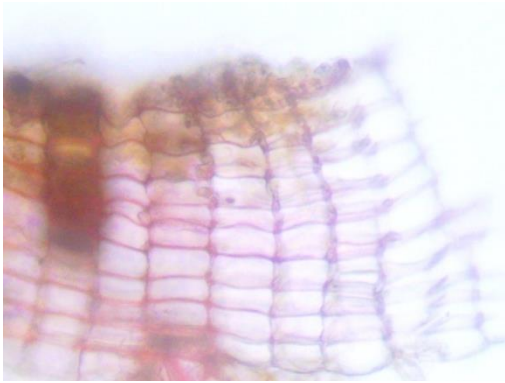
Figure 2: T.S. of Root of *Albizia lebbeck* (Linn) Benth.

Physicochemical parameters namely., loss on drying, ash value, acid insoluble ash, water soluble ash, water soluble extractive, alcohol soluble extractive were performed as per the standard procedures.¹⁴

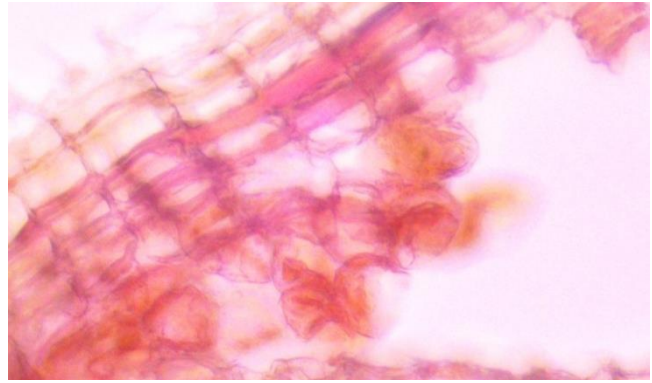
RESULTS AND DISCUSSION

Macroscopy

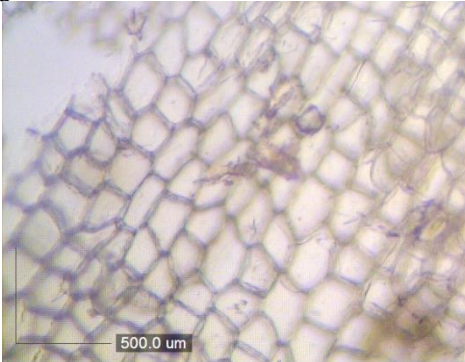
Root is hard, cylindrical, and rough with lenticels, brownish grey in color. Bark is rough with lenticels, brownish grey in color. Wood- Hard, light yellow or



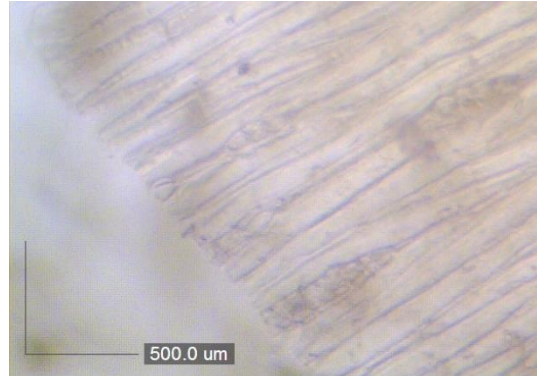
Fragment of cork in sectional view.



Thin walled stone cell



Fragment of cork in sectional view



Fragment of radially cut medullary rays from xylem region



Pitted vessel



Fragment of tangential cut medullary rays from phloem region



Starch grains



Thin walled fibres

Figure 3: Powder microscopy of root of *Albizia lebbek* (Linn) Benth.

cream, fibrous. The odour of root is characteristic and taste is slightly astringent. (Figure 1).

Microscopy

Transverse section of root shows an outer layer of cork which is seven to nine layers of irregular tabular cells of

non uniform size. Outer layer contain reddish brown amorphous matter and the inner layer show thick walled colorless cells; followed by wide zone of cortex composed of thirty to thirty five layers polygonal cells especially hexagonal in shape of non uniform sizes. Stone

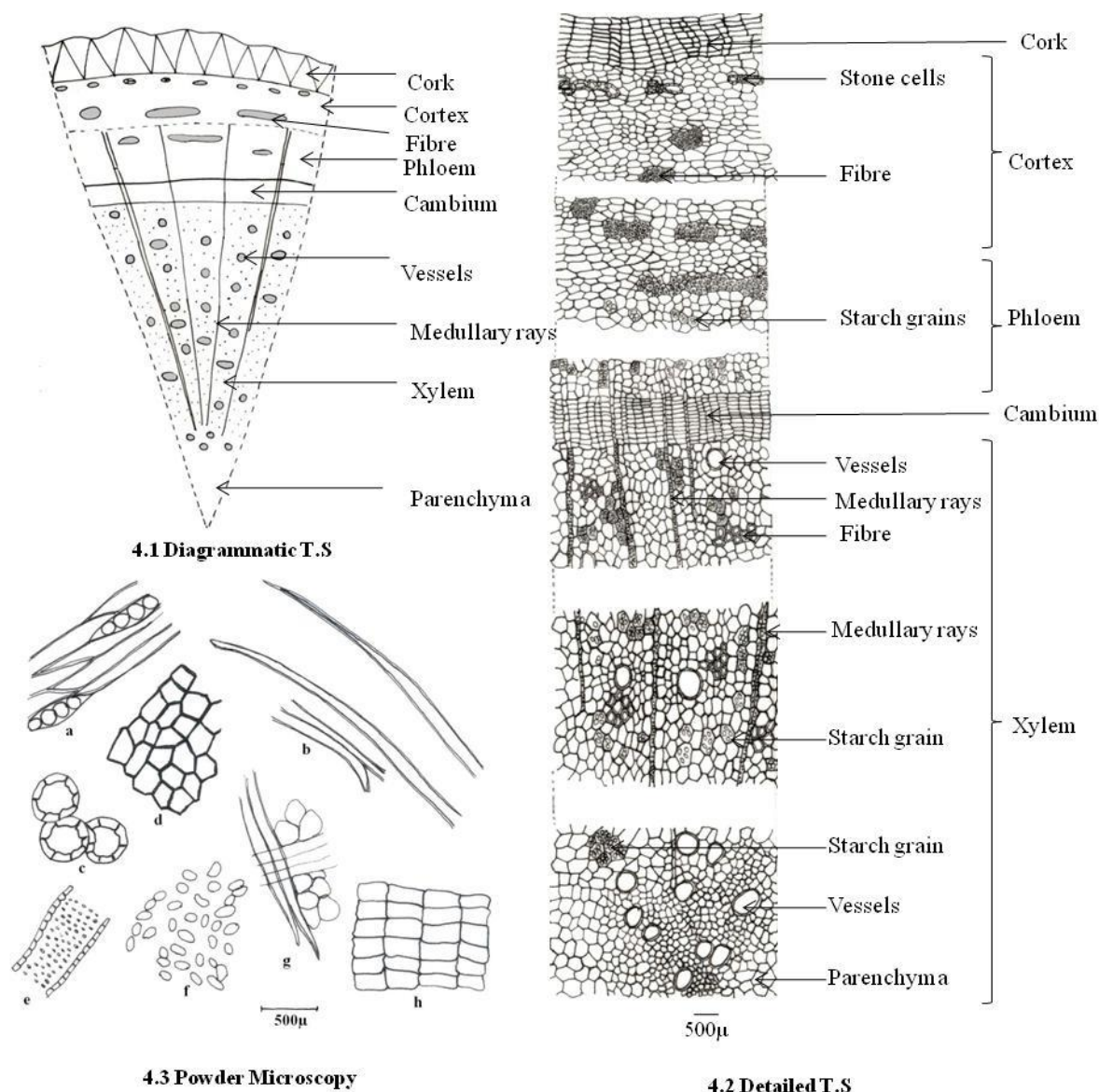


Figure 4: Camera Lucida drawing of diagrammatic T.S., detail T.S. and powder microscopy of root of *Albizia lebeck* (Linn) Benth (Fig 4.3. a.Fragment of radially cut medullary rays from xylem region, b. Thin walled fibres, c. Thin walled stone cell, d. Fragment of cork cell in surface view, e. Pitted vessel, f. Starch grains, g.Fragment of tangential cut medullary rays from phloem region, h.Fragment of cork in sectional view).

Table 1: Histo-chemical analysis of Root of *Albizia lebeck* (Linn.) Benth.

Sr. No.	Test	Chemical	Observation	Result
1	Lignified cell	Phloroglucinol + HCl	Pink to cherry red colour	+
2	Cuticular cell	Sudan red -III	Orange red or red	-
3	Aleurone grains	Iodine	Yellowish brown to brown	-
4	Fats, fatty oils, volatile oils and resins	Sudan red- III	Orange red to red	-
5	Mucilage	Ruthenium red	Pink	-
6	Starch	Iodine	Blue or reddish blue	+
7	Calcium oxalate crystals	Hydrochloric acid	Dissolved	+
8	Calcium carbonate crystals	Hydrochloric acid	Dissolved with effervescence	-

cell and fibers are scattered in some cortex containing oval starch grains and traversed with few patches of stone cells; Phloem is composed of twenty eight to thirty two layers. Simple and compound starch grain are scattered in

some phloem cell. Cambium is composed of ten to eleven layer thin walled tubular cells. Xylem is composed of numerous layers. Xylem fibres are thick and lignified. Starch grains are scattered in xylem. Xylem vessels are

Table 2: Fluorescence analysis of Root of *Albizia lebbek* (Linn.) Benth.

Sr. No.	Test	Day light	254nm	366nm
1.	Powder as such	Rosy Buff	Rosy Buff	Brown vinaceous
2.	Powder + H ₂ O	Dark Apricot	Dark purple	Brown vinaceous
3.	Powder + HCl	Bay	Fuscous Black	Dark Fuscous Black
4.	Powder + HNO ₃	Scarlet	Umber	Iron grey
5.	Powder + H ₂ SO ₄	Chestnut	Chestnut	Brown vinaceous
6.	Powder + Glacial Acetic acid	Cinnamon	Isabelline	Hazel
7.	Powder + 18 N HCl	Bay	Greenish sepia	Purplish grey
8.	Powder +50% HNO ₃	Rust	Fawn	Dark brick
9.	Powder +50% H ₂ SO ₄	Dark brick	Brown vinaceous	Fuscous Black
10.	Powder +50% G. Acetic acid	Scarlet	Isabelline	Iron grey
11.	Powder + 1N NaOH	Blood colour	Dark mouse grey	Fuscous Black
12.	Powder +1N KOH	Chestnut	Dark mouse grey	Fuscous Black
13.	Powder +5 % Iodine	Chestnut	Brown vinaceous	Fuscous Black
14.	Powder +5 % FeCl ₃	Dark olivaceous	Dark grey olivaceous	Olivaceous black
15.	Powder + Liquid NH ₃	Dark apricot	Dark brick	Brown vinaceous

Table 3: Behaviour of *Albizia lebbek* (Linn) Benth.–Root powder with different chemical reagents.

S.No	Test	Observations
1.	Conc. H ₂ SO ₄	a) Powder floats on Surface. b) On shaking powder move down up to 1.5 cm and remain suspended. c) Powder colour changed from light brown to black.
2.	Conc. HNO ₃	a) Powder floats on Surface. b) On shaking few particles move down slowly and majority of particles remains suspended. c) About 1.5 cm foam formed at top. d) Powder colour changed from light brown to yellowish orange.
3.	Conc. HCl	a) Powder floats on Surface. b) Few particles slowly move down. c) On shaking majority of particles move down and remain suspended and few settled down and fibrous particles moved upward at the top. d) Powder colour changed from light brown to dark brown.
4.	Glacial Acetic acid	a) Powder immediately moves down. b) Fibrous particles moved upward at the top. c) No colour changed in powder.
5.	5% I ₂ water	a) Powder floats on surface. b) On shaking few particles settled down few remain suspended.
6.	5% FeCl ₃	a) Powder immediately settled down. b) Colour changed from light brown to greenish black.
7.	5% NaOH	a) Powder floats on surface. b) Few particles move down. c) On shaking particles move down and settled at the bottom; few remains suspended and fibrous particles moved upward at the top. d) About 1.5 cm foam formed at top. e) Colourless solution of NaOH turned to dark brown and no colour change in powder
8.	5% KOH	a) Powder floats on surface. b) Few moves down. c) On shaking particles moves down fastly and settled down at bottom and few remains suspended. d) About 1.5 cm foam formed at top. e) Colourless solution of KOH turned to dark brown and no colour change in powder

few in number and thick walled.

Medullary rays are uniseriate and biseriate in nature. (Figure 2 and Figure 4).

Powder Microscopy

Powder under microscope showed different anatomical characters. Details of characters recorded are given in Figure 3 and Figure 4.

Histochemical and fluorescence analysis

Powder drug was analysed for histochemical tests for detection of lignin, aleurone grains, oils, mucilage and crystals. Analysis revealed that root contains lignin, resins, starch and calcium oxalate crystals (Table- 1).

Powder drug was treated with different chemical reagents and observed in day light and ultra-violet light and

Table 4: Physico-chemical contents of Root of *Albizia lebbek* (Linn.) Benth.

S.No	Parameter	Result (%)
1	Loss on drying	7.34
2	Total Ash	6.63
3	Acid insoluble ash	0.91
4	Water soluble ash	1.12
5	Water soluble extractive	11.31
6	Alcohol soluble extractive	14.82

inferences was recorded in Table- 2. Drug colour changed after reacting with chemical and observed under 254 and 366 nm would be characteristics for particular drug and would be beneficial to identify the root of *Albizia lebbek* (Linn) Benth.

Behaviour of drug with different chemical reagent showed that drug immediately move down in Glacial acetic acid, 5% FeCl₃ solutions whereas powder colour changed in concentrated H₂SO₄, HNO₃, HCl solutions and 5% FeCl₃ solution. Details of observations are exhibited in Table- 3.

Determination of physicochemical parameters

Results obtained from physico- chemical contents such as, loss on drying, total ash, acid insoluble ash, water soluble ash, water and alcohol soluble extracts are depicted in Table 4.

CONCLUSION

The present study on pharmacognostic standardisation, physicochemical evaluation of *Root of Albizia lebbek* (Linn) would be used as standard in regard to its identification and quality assurance parameters.

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CONFLICT OF INTREST

Nil.

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