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STUDIES ON MORPHOLOGY, ANATOMY AND PHYTOCHEMISTRY OF ALSTONIA SCHOLARIS (L.) R. Br. BARK

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ABSTRACT

The bark of *Alstonia scholaris* (L.) R. Br. (Apocynaceae) Bark is reported to be used in skin-diseases, diarrhoea and dysentery, also for snakebite. It is proved valuable in chronic diarrhoea and in advanced stage of dysentery. It is an efficient remedy in debility after fevers and other exhausting diseases. It is used in heart diseases, asthma and stop bleeding of wounds. Attempts were made to standardize the bark on the basis of its morphology, anatomy, maceration and phytochemical studies.

KEYWORDS: *Alstonia scholaris*, Bark, Standardization.

INTRODUCTION

The bark of *Alstonia scholaris* (L.) R. Br. (Apocynaceae) commonly known as *Saptaparni*. Bark is stimulant, carminative, stomachic, bitter, tonic, astringent, expectorant, alterative, anthelmintic and galactogogue. It cures gastro-intestinal troubles. It is mild, febrifuge, anti-periodic, useful in intermittent malaria like quinine (Gandhi and Vinayak 1990). It is useful in skin-diseases, diarrhoea and dysentery, also for snakebite. It is proved valuable in chronic diarrhoea and in advanced stage of dysentery. It is an efficient remedy in debility after fevers and other exhausting diseases. It is used in heart diseases, asthma and stop bleeding of wounds. Bruise and boiled in cottonseed oil, the bark is applied to the ear of deafness. Fresh bark juice with milk is administered in leprosy and dyspepsia. Stem bark and leaves of *Vitex nigundo* are used as poultice in body ache and joint pains (Joshi 2000). Ditanin is active principle of the bark possess powerful febrifuge and antiperiodic properties (Nadkarni, 1998). Its extract in combination with berberine hydrochloride having anticancer activity (Jagetia and Baliga 2004). The bark extract has also a significant anti-fertility effect in male rats (Gupta et al 2002). Bark extracts acting against human lung cancer cell lines (Keawpradub et al 1997), immuno stimulating (Iwo et al 2000), antiplasmodial activity (Keawpradub et al 1999).

MATERIALS AND METHODS

During present investigation the bark samples of *Alstonia scholaris* were collected from Dr. Babasaheb Ambedkar Marathwada University campus, Aurangabad and their morphological, anatomical and maceration characters were studied. For anatomical studies free hand sections of the bark were taken, double-stained and mounted permanently by following standard methods (Esau, 1965) and observed under compound microscope. The dry bark samples were macerated with Jeffery's Macerating Fluid as described by Johanson (1940). The bark powder was kept in different solvents for 48 hours in air tight containers, filtered, the filtrate was evaporated to dryness, dry weight was recorded and the percent extractive value was calculated (Sadashivam and Manickam, 1992). Phenolic acids were detected as described by Daniel M. (1991).

RESULT AND DISCUSSION

Morphology: Thickness of fresh bark 9 to 17 mm and dried bark 6 to 10 mm, hard, outer surface dark gray to brown, older bark very rough uneven at much fissured transversely and longitudinally, both marked with numerous rounded and transversely elongated, gray to whitish, brown lenticels; inner surface brownish buff, greyish brown somewhat striated and indented; fracture smooth and short, taste very bitter, channelled.

Anatomy: T.S. of bark reveals outer cork of thick walled cells in 20-40 layers, cells are tangentially elongated 10-

15 x 40-60µ, followed by inner cork of thin walled cells, which are of 20-40 layers. These cells are of same sizes than outer cork cells. Cork cells usually brick shaped in T.S. and polygonal in surface view. Cork cambium forms 2 celled thick layered, which are identical to cork and secondary cortex. The cork cells impregnated with dark black coloured contents and some cells with light brown coloured contents. There is broad zone of secondary cortex composed of thin walled oval or polygonal. parenchymatous cells measured from 30-70µ diameter. Each parenchymatous cell is highly impregnated with starch grains. Starch grains are circular to ovate, and eccentric. Secondary cortex has many rounded latex cavities, which are circular to oval or polygonal in outline, and 70-90µ in diameter. Some cortical cells containing rhomboidel to polygonal crystals of calcium oxalate. The zone of cortex has 4-8 continuous layers of stone cells. Stone cells irregular, rounded, oval, polygonal or linear stone cells measure from 30µ in diameter, 50µ in bredth and up to 110µ in length. Secondary phloem composed of phloem parenchyma, sieve elements and companion cells. Phloem cells smaller than the cortical cells. Ray parenchyma or phloem rays or medullary rays are biseriate, composed of rectangular barrel shaped

MACERATION

Maceration of mature bark reveals. The parenchyma is of two types one is large squarish or slightly rectangular moderately thick walled measured from 70-100 x 90-120µ. Second type of parenchyma is thin walled linear, elongated, rectangular or ovate measured from 25-40 x 120-145µ. Both the parenchymatous cells show small cytoplasmic contents which are attached to the cell wall (Fig 6a & b). Stone cells are of various shapes squarish, rectangular or polygonal, cell wall shows thickening with striations, lumen is large 80-100 x 90-140µ (Fig 6c). Crystalline fibre 20-25µ thick, tapering at ends with thick lumen. A row of circular, rectangular, squarish and polygonal crystals are associated with it. The fibres are 1100-1600µ in length (Fig 6d). Laticifers are of two types septate and branched, septate laticifer is latex vessel, composed of many rectangular cells, which is unbranched, thickness around 40µ (Fig 6e). The branched laticifer, which is unseptate, is latex cell. Each branch 35-40µ thick. The laticifer are full of yellow colour inclusions.

Phytochemistry

The chemicals present in bark drugs of *Alstonia scholaris* were analyzed qualitatively as well as quantitatively following (Dhabe, 2003; Mungikar, 1999; Sadasivam and Manickam, 1992). Occurrence or absence of specific chemicals may give the criteria to evaluate standardize the drug. The chemistry of bark is given in table 01, 02, and 03.

01. Phytochemistry of bark

Chemical composition	% of DM
Dry Matter (DM)	36.50
Bulk Density mg/cm^3	393
Total Ash	9.70
Nitrogen (N)	0.58
Water soluble Nitrogen (WSN)	0.15
Carbohydrates	81.68
Total Sugar	2.07
Reducing Sugar	1.73
Non Reducing Sugar	0.34
Crude Fibre (CF)	25.70
Crude Fat (C Fat)	5.0
Cellulose	34
Hemicellulose	12.2
Lignin	5.1
Tannins	7.65
Gross Energy Kcal/gm	3.51
Calcium (Ca)	3.17
Phosphorus (P)	0.184
Potassium (K)	0.955

02. Extractive values.

Solvents	Percentage
Water	13.08
Methanol	7.2
Alcohol	5.8
Benzene	2.2
Petro. Ether	2.18
Chloroform	1.62
Acetone	2.28

03. Distribution of Phenolic Acid

Phenolic acid	Status
Vanilic acid	+
Syringic acid	+
Ferulic acid	+
Protocatechuic acid	-
P-hydroxy benzoic acid	-
P-coumaric acid	-
Phloretic acid	-
Melilotic acid	-

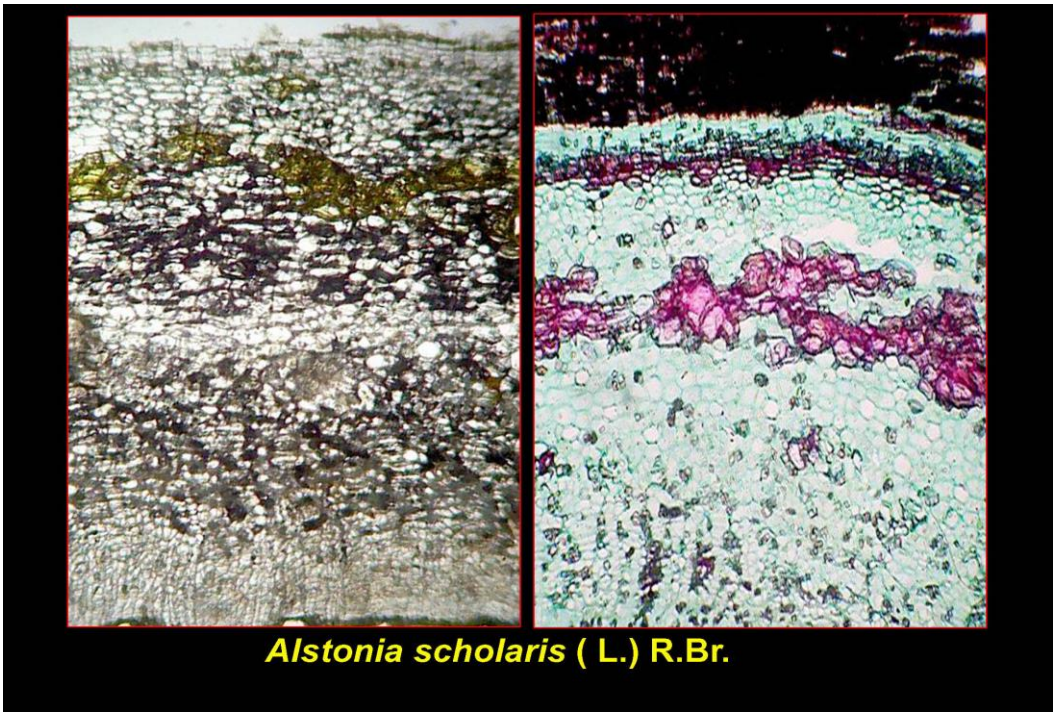
Plate 6

A flowering twig

Outer surface of bark

Inner surface of bark

Alstonia scholaris **(L.) R.Br.**



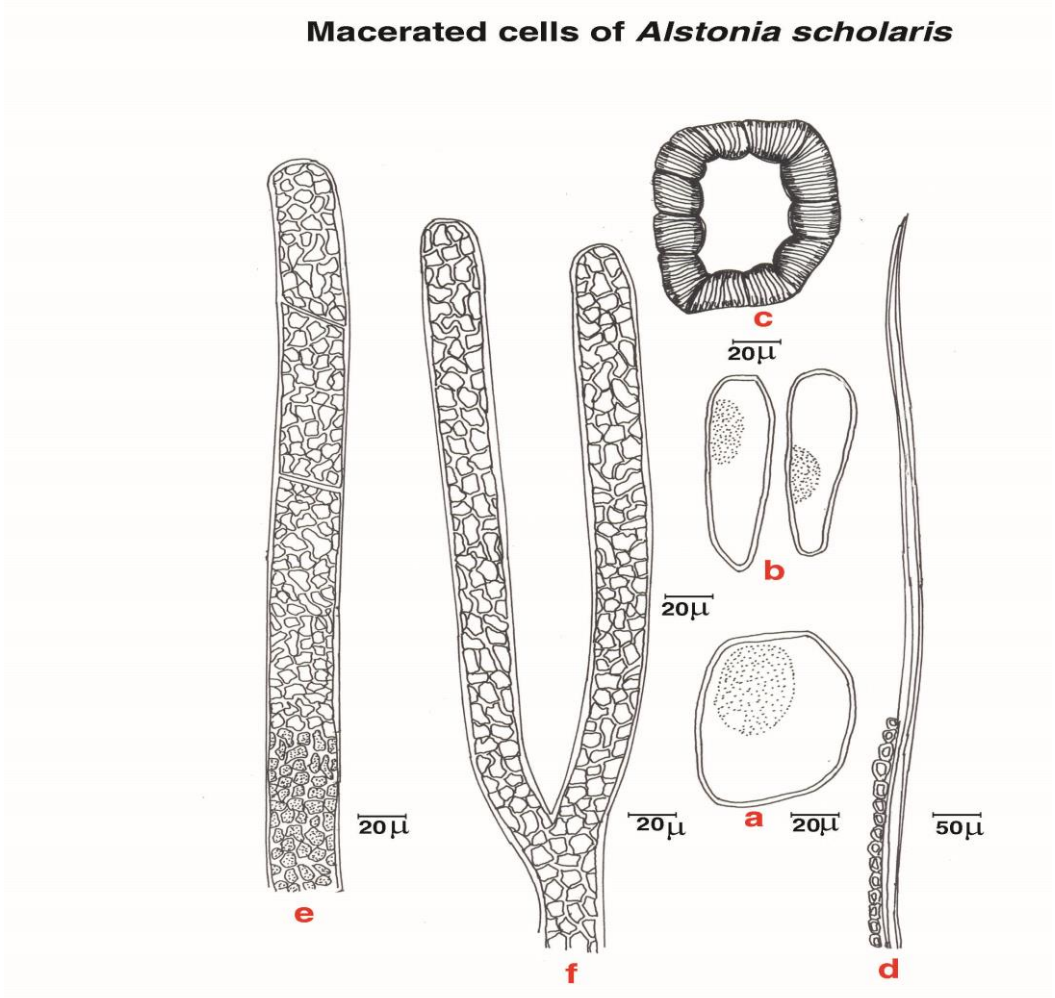


Fig 6 a, b- Parenchymatous cells, c- Stone cell, d- Crystaline fibre, e- Latex vessel (septate), f- Latex cell (branched),

CONCLUSION

Anatomical features including cork, cortex and secondary phloem, macerated cells like fibres, crystalline fibres, stone cells, latex cells and vessels and parenchymatous cells form the criteria for the standardization of *Alstonia scholaris* bark. Another important parameters like 36.5% dry matter, 3.93 mg/cm3 bulk density, 9.70% ash, 9.40% acid soluble ash, 0.30% acid insoluble ash, 2.55% water soluble ash, 7.45% water insoluble ash, 0.58% nitrogen, 0.15% water soluble nitrogen, 3.62% crude proteins, 81.68% carbohydrates, 1.73% reducing sugar, 0.34% non reducing sugar, 2.07% total sugar, 25.70% crude fibres, 5.0% crude fats, 34.00% cellulose, 12.2% hemicellulose, 5.1% lignins, 7.65% tannins can also be used as a criteria of standardization of *Alstonia scholaris* bark. The extractive values of *Alstonia scholaris* bark are 13.08% in water, 7.2% in methanol, 5.8% in alcohol, 2.2% in benzene, 2.18% in petroleum ether, 1.62% in chloroform and 2.28% in acetone are considered as strict parameters. Presence of ferulic acid also used as a criteria. The above all parameters in combinations determine genuinity or authenticity of the *Alstonia scholaris* bark.

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