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AYURVEDIC PHYTOCHEMICAL AND PHARMACOLOGICAL INFORMATION ON *SAPTAPARNA (Alstonia scholaris)*: A REVIEW ARTICLE

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ABSTRACT

Saptparna with the botanical name *Alstonia scholaris*, commonly called as blackboard tree or devil's tree. *Saptparna* is an evergreen tropical tree in the family *Apocynaceae*. This species is found in the sub-Himalayan tract from Yamuna eastwards, ascending up to 1000m. It occurs in tropical, subtropical and moist deciduous forest in India, and is widely cultivated as avenue tree throughout India. *Saptaparna* name comes from two Sanskrit words, *Sapta* meaning seven, and *parni* meaning leaves. As the name suggests, the leaves most often are found in groups of seven around the stem. In *Ayurveda* it is used in various skin disorders, therefore *Aacharya Charaka* mentioned this drug in *Kushtghna* (Anti-leprosy) and *Udardprashmana* (Skin disoreders) classes. The bark is known as ditabark, contains the alkaloids ditamine, echitenine, echitamine and strictamine, used by Indians as traditional medicine to treat diarrhea, dysentery, asthma and a few types of fevers. It has *Tikta, Kashaya rasa, Katu vipaka* and *Ushna virya hence* it mostly useful in *Kapha-pitta* diseases such as *Jwara* (fever), *Kushtha* (leprosy), *Gulma* (cyst), *Vrana* (wound) etc. The extract of the plant showed pharmacological activities like anti-malarial, antidiabetic, antibacterial, antianxiety, anti-inflammatory, antiulcer, anticancer, anti-microbial, antidiarrheal, antioxidant, wound healing activities etc. These reviews draw the attention towards *ayurvedic* information, phytochemistry, therapeutic uses and pharmacological actions of *Saptaparna.*

KEYWORDS: *Saptaparna*, *Alstonia scholaris*, *Ayurvedic* aspect, Pharmacology.

INTRODUCTION

Saptaparna - *Alstonia scholaris* R. Br. is an important medicinal plant in traditional medicine. It grows throughout the India, in deciduous and evergreen forests and in plains. The plant *Alstonia scholaris* also known by various names like Devils tree, Dita Bark tree, White cheese wood, verbal, Milk wood pines, Milk wood, milky pine, black board tree belonging to *Apocynaceae* family. It has been used in Ayurvedic, Unani and Sidhha types of traditional medication for the treatment of diseases and illnesses of human being.[1] In traditional medicine, the *swarasa* (fresh juice) of plant is applied on injuries and ulcers to treat the pain including rheumatic pain. In ayurvedic medicine this plant holds a good place as antimalarial agents. Juice of leaves and extract of the bark acts as a powerful galactogogue and also used in cases of snake bite.[2] The *Alstonia scholaris* (L) R.Br. has been used in Western medicine (British pharmacopoeia, 1914) as antimalarial drug. Early clinical trials (Manila hospital and India) have discovered the ability of thisplant to decrease malaria fever. It is a beautiful foliage tree with a large covering, and because of this, it has become a popular ornamental tree in the landscapes and gardens in the warm and moderate regions of Florida, Texas, and California in the United States.[3] Herbal medicine contains natural substances that can promote health and reduce illness. Ayurveda utilizes plenty of herbs to cure different ailments.

AYURVEDIC ASPECTS

Classification of *saptaparna* in *Brihattray*[4]

No	*Gana/varga*	*Charka Sanhita*	*Susrut Sanhita*	*Astrang Sagraha*	Astrang Hradya
1.	*Churna Pradeha*	+	-	-	-
2	*Kushthaghna Mahakashya*	+	-	+	-
3	*Udardprashamana Mahakashaya*	+	-	+	-
4	*SantarpanaSamuthita vyadhihara*	+	-	-	-
5	*Sarasava*	+*Sara*	-	-	-
6	*Vaman Dravya*	+*Mula*	-	+*Mula*	-
7	*Tikta Skandha*	+	+	+	-
8	*Kashaya Skandha*	+	-	+	-
9	*Shirovirechana Dravya*	+*Pushpa*	-	+*Beeja*	-
10	*Aragwadadi Gana*	-	+	+	+
11	*Lakshadi Gana*	-	+		-
12	*Adhobagahara Dravya*	-	+*Ksheera*	+*Ksheera*	-
13	*Pratisaraniya Kshara*	-	+*Kshara*	+*Kshara*	-

Classification of *Saptaparna* In *Nighantus*

No	***Nighantu***	***Varga***
1	*Dhanvantari*[5]	*Chandanadi Varga*
2	*Madanpala*[6]	*Vatadi Varga*
3	*Kaiyadeva*[7]	*Aushadhi Varga*
4	*Bhavaprakasha*[8]	*Vatadi Varga*
5	*Raja*[9]	*Chandanadi Varga*
6	*Nighantu Aadarsha*[10]	*Kutajadi Varga*

Synonyms Of *Saptaparna* Mentioned In *Nighantus*

No	**Synonyms**	***Dh. Ni.*[5]**	***M. Ni.*[6]**	***Kai. Ni.*[7]**	***Bha. Ni.*[8]**	***Raj Ni.*[9]**
•	*Ayugmaparna*					+
•	*Gandhiparna*					+
•	*Guchapatra*					
•	*Guchapushpa*		+			+
•	*Guchapushpaka*		+			
•	*Gudhapushpa*	+				
•	*Guhashayana*					
•	*Chatraparna*	+				
•	*Chatri*		+	+		
•	*Triparna*			+		
•	*Patravarna*					+
•	*Parni*			+		
•	*Pruthakapatra*					
•	*Bahuchada*					
•	*Bahucheda*			+		
•	*Bahutwaka*					
•	*Bahuparna*					+
•	*Bruhat-twaka*			+		+
•	*Bruhat-patra*					
•	*Madagandha*					+
•	*Munichanda*					+
•	*Yugmapatra*					
•	*Yugmapushpa*					
•	*Vankibhumita*					+
•	*Vishalatwaka*				+	
•	*Vishamachada*				+	
•	*Vidyneya*					+
•	*Sharada*			+	+	
•	*Shalmalichada*					
•	*Shalmliptraka*	+	+	+		+
•	*Shalmaliparnaka*					
•	*Shuktipatra*			+		
•	*Shuktiparna*	+				+
•	*Saptanga*					
•	*Saptachada*	+				+

•	*Saptaparna*	+	+	+	+	+
•	*Sapthavaha*			+		
•	*Sudirgha*					
•	*Suparnaka*	+		+		+
•	*Suvarna*					
•	*Sthulapatra*			+		
•	*Sharadiya*		+			
•	*Madagandhi*		+			
•	*Shiroruja*		+			
	Total	07	08	12	04	15

Therapeutic Indications Of *Saptaparna* In *Nighantus*

No.	Diseases	*Dh.Ni.*[5]	*M.Ni.*[6]	*Kai.Ni* [7]	*Bha.Ni.*[8]	*Raj.Ni.*[9]
1	*Krimi* (worm infestation)	+	-	+	+	+
2	*Shwasa*(Respiratory system)	-	-	+	+	-
3	*Kushtha* (skin deasese)	+	+	+	+	-
4	*Gulma* (tumor)	+	-	+	+	-
5	*Vrana* (wound)	-	+	+	+	+
6	*Raktamay*	-	-	-	-	+
7	*Shoola* (pain)	+	-	-	-	-
8	*Raktarujapaha*	-	-	-	-	-

Gunakarmas* Of *Saptaparna* In *Nighantus

No	*Rasapanchak*		Dh. Ni.[5]	*M. Ni* [6]	*Kai. Ni* [7]	*Bha. Ni*[8]	*Raj. Ni*[9]
1.	***Rasa***	*Kashaya*			+	+	
		Tikta					+
2.	***Guna***	*Snigdha*			+	+	
		Sara	+	+	+	+	
		Surabhi	+				
		Madagndhi					+
3.	***Veerya***	*Ushna*			+	+	+
4.	***Vipaka***	*Katu**					
5.	***Karma***	*Deepana*	+		+	+	+
		Hridaya	+	+			+

Properties and action mentioned in *Ayurveda*-[11]

Guna: *Laghu* (light), *Snigdha* (Oily) ***Rasa:*** *Tikta* (bitter), *Kashaya* (Astringent)***Vipaka:*** *Katu* (pungent)

Veerya: *Ushna* (hot)

Dosha: *Kaphapittashamak*

Vishista yoga- *Saptacchadadi kwada, Saptacchadadi tail, Saptacchadadi vati*

Dosage – Stembark-20-30 g for decoction.

According to *Ayurveda, Saptaparna* used to cure many allements such *as Kushtha, Shwasa, Gulma,Vishmjwara, Visarpa.*

Morden aspects:-Indian Names[12]

Bengali: Chattim
Hindi: Saptaparni, Shaitankajhar, Chitvan
Kannada: AeleleHaale, Bantale, Doddapala
Malayalam: Daivappala
Marathi: Satvin
Sanskrit: Saptaparna
Tamil: Ezilaipillai, mukumpalai
Telugu: Daevasurippi
Gujrati: Satvana.

Taxonomical Distribution[13]

Kingdom: Plantae
Subkingdom: Viridiplantae
Infrakingdom: Streptophyata
Superdivision: Embryophyata
Division: Tracheophyata
Subdivision: Spermatophytina
Class: Magnoliopsida
Superorder: Asteranae
Order: Gentianales
Family: Apocynaceae
Tribe: Plumeriae
Subtribe: Alstoniinae
Genus: *Alstonia*
Species: *A. scholaris*

Morphology: *Saptaparna* is a medium-sized evergreen tree, usually 12–18 m high, sometimes upto 27 m high. Bark is rough, grayish-white, yellowish inside, and exudes bitter latex when injured. Leaves are four–seven in a whorl, and are thick, oblong, with a blunt tip. They are dark green onthe top, and pale and covered with brownish pubescence on the dorsal surface.[11]

Flowering and fruiting time:-December–March and May–July.[11]

The plant large evergreen tree[14,15,16]

Bark	Greyish brown, rough, white milky latex that flows rapidly when cut**.**
Leaves	4-7 in a whorl, bluntly acuminate, pale beneath.
Flowers	Small, Greenish white, numerous in umbellate Panicles, Scented.
Fruits	Dehiscent follicles, brown or green, spindle shaped, a pendulous, two lobed
Seed	Flat oblong, brownish hair at each end.

Propagation and cultivation[17,18]**:-** The tree is sometimes planted in gardens for ornamental purpose. It is easily raised through seeds and prefers fairly moist conditions.

Necessary Altitude: 0-900 M

Mean Annual rainfall: 1200-1400 mm

Soil type: Soil including alluvia, basaltic red earth, yellow earth with grey brown top soil, sandygrey earth.

Phytochemistry[17]**:-** The plant bears a good esteem of chemical compounds. It is known to be richsource of alkaloids which are useful for medicinal purposes.

Stem bark-It having echitamine, new glyco-side-renoterpine, glucoside triterpenes, a-amyringacetate, echitamidine, echitenine, Ditamine.

Root- It contains akuammigine, tubaitowine, akuammigine, Hydroxyl-19.

Leaves- It contains an indole alkaloid- pic-rinine, botalin, ursolic acid, β- sitosterol, new alkaloid Scholarin.

Flowers- Picrinine, strictamine are present in flowers.

Fruits- Fruit contains Akuammidine (rhazine).

PHARMACOLOGICAL ACTIVITIES

Antibacterial activity

In-vitro antibacterial activity of methanolic, aqueous and total alkaloid extracts from the trunk bark against two gram-positive bacteria including bacillus subtilis and streptococcus pyrogens and four gram negative bacteria, Escherichia coli, pneumoniae, Pseudomonous aeruginosa and proteus mirabilis using disk diffusion method. All extracts showed varying degrees of inhibitory activity against all bacteria. Aqueous extract was found very active against both gram-positive and gram-negative bacteria in comparison to other extracts. Total alkaloid extract was found only active against gram-negative bacteria.[19] The methanol leaves extract exhibited broad-spectrum antibacterial activity against tested organisms. Maximum activity was exhibited against *Bacillus subtilis* followed by *Escherichia coli* and

S*taphylococcus aureus*. Chloroform and acetone leaf extracts exhibited lesser activity, while petroleum ether extract showed no inhibition.[20]

Analgesic and anti-inflammatory activity

Leaf of *A. scholaris* contain alkaloids like picrinine, vallesamine and scholaricine are reported to showanalgesic and anti-inflammatory activity based on several in vivo assays. In in vitro tests, alkaloids exhibited inhibition of inflammatory mediators (COX-1, COX-2 and 5-LOX), which is accordant with results on animal models.[21]

Ant diabetic and antihyperlipidemic activity

Ethanolic extract of *A. scholaris* and glibenclamide were found to significantly reduce the blood glucose level, glycosylated hemoglobin and lipid peroxidation, whereas they increased body weight, liver and muscle glycogen and antioxidant status, whereas histopathology of pancreas revealed that the pancreatic β-cell damage with streptozotocin did not reverse.[22]

Hepatoprotective activity

The methanolic stem bark extract of *A. scholaris* was effective in improving function of hepatocytes and proven to significantly decrease the biochemical parameters such as SGOT, SGPT, ALP, TP and TB.[23]

Anti-arthritic and antioxidant activity

A. scholaris ethanolic extract decreased the arthritis significantly which was speciously visible with arthritis index, body weight and leukocyte infiltration, as well as significant reduction in gastric lesion indices and gastric juice secretion. Significant increase was found in the antioxidant enzymes such as glutathione, glutathione peroxidase and superoxide dismutase, as well as significant reduction in the levels of lipid peroxidation and myeloperoxide in the articular tissue were evident.[24]

Anticancer activity

The bark extract of *A.scholaris* has been proven anticancer activity against radiation induced biochemical alteration in mice by ameliorating cholesterol and lipid peroxidation. Alcoholic extracts of *A. scholaris* reportedly reduced the total aberrant cells and it reduced total frequencies of aberration *invivo.*[25]

Antiplasmodial activity

Keawpradub *et al.* evaluated the antiplasmodial activity of the methanolic extracts of several

parts of *A. scholaris* which was tested against multidrug-resistant K1 strain of *Plasmodium falciparum* cultured in 73 human erythrocytes. Pronounced antiplasmodial activity was exhibited. The indole alkaloids were isolated from the active extract and were subsequently tested against the K1 strain of *P. falciparum*. They reported pronounced antiplasmodial activity mainly among the bisindole alkaloids, particularly villalstonine and macrocarpamine with IC50 values of 0.27 and 0.36 µM, respectively.[26]

Antifertility activity

Lupeol acetate isolated from benzene extract of *A. scholaris* has been reported to show antifertility effect.[27]

Antitubercular activity

Methanolic extracts of leaf, stem bark and root bark of *A. scholaris* has been proven to have anti- tubercular activity. The anti-mycobacterial activity showed that *A. scholaris* extract has the potential to cure tuberculosis.[28]

Ameliorating effect

Aqueous bark extract of *A. scholaris* has been reported to reduce injury in the liver and kidney sections histopathologically compared to viper venom which may be shown effective to the complexation of polyphenols with venom enzymes.[29]

Antidiarrheal activity

The antidiarrheal effects of the aqueous and the alcoholic bark extracts of *A. scholaris* in mice were reported.[30]

CONCLUSION

The plant contains various chemical constituents like alkaloids, coumarins, flavonoids, leucoanthocyanins, reducing sugars, simple phenolics, steroids, saponins and tannis. In *Ayurveda* this plant mentioned in various classes according to their properties such as, *Tikta Skandha*(bitter), *Kashaskandha* (astringent), *Kushtghna* (anti-leprosy), *Udardprashmana* (skin disorders), etc. Due to its *Tikta, Kashaya rasa* it is useful to reduce *Kapha* and *Pitta dosha*. Also it has *Katu vipaka* and *Ushna virya* therefore it will reduce the infection and do the wound healing action. Due to its various properties it work in various diseases like *Krimi* (worm infestation), *Shwasa* (Respiratory system), *Kushtha* (skin deasese), *Gulma* (Tumor), *Vrana* (Wound), *Shoola* (pain) etc. Further study on this topic is yet to be done. The research

on this study is still going on.

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