A REVIEW ON NOOTROPIC EFFECTS OF SAPTPARNA

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ABSTRACT

Nature has gifted our planet with abundance of medicinal plants wealth that are cherished with several useful pharmacological properties. Each and every plant has some medicinal property in one or the other way, only we have to know and explore their uses in particular doses and conditions. There are lots of herbs, which are not much studied scientifically though they are used for some ornamental or other purposes like Alstonia scholaris or Saptaparna. The herb has plenty of medicinal values that boost up brain mechanism and can be used in brain disorders. They are anti inflammatory, anti oxidant and free radical scavenging, immune-stimulating and anti choline esterase. In the present review, the researches related with nootropic effect of Alstonia scholaris has been enlightened.

KEYWORDS: Alstonia scholaris, nootropic.

INTRODUCTION

Numerous plant species have been documented pharmacologically and clinically to possess medicinal properties. Herbal medicines are gaining popularity and becoming basic part of healthcare systems. The upcoming scientific researches are boosting the traditional usage and acceptance of herbal drugs. The scientific scrutiny about the dosage, indications and contraindications of the herbal medicines are providing stamp on their safe usage. Alstonia scholaris Linn, which is also called “Saptaparna” or the “Devil tree” belongs to the family apocynaceae, has abundant of medicinal potential. It is very common tree and reach up to 3 meters in height and is found in sub Himalayan belt, west Bengal, Uttar Pradesh, Bihar,
peninsular India and south east Asia. Historically the plant was scientifically named by Linnaeus as *Echites scholaris*. However to commemorate the great botanist Professor C. Alston (1685-1760), at Edinburgh University the generic name was changed to *Alstonia*. The specific name scholaris is derived from the use of the wood for school boards in Myanmar.

Alstonia scholaris is known to be a potent medicinal plant and have already been studied for the bioactive principles present in it.

**Vernacular names of Alstonia Scholaris**

<table>
<thead>
<tr>
<th>Language</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Dita bark, white cheese wood</td>
</tr>
<tr>
<td>Hindi</td>
<td>Chitvan, Satvin</td>
</tr>
<tr>
<td>Sanskrit</td>
<td>Saptaparna</td>
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<tr>
<td>Bengali</td>
<td>Chattin</td>
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<tr>
<td>Tamil</td>
<td>Pala</td>
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<tr>
<td>Gujarati</td>
<td>Saptaparni</td>
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**Systemic position of Alstonia scholaris**

- **Kingdom**: Plantae
- **Order**: Gentianales
- **Family**: Apocynaceae
- **Tribe**: Plumeriae
- **Genus**: *Alstonia*
- **Species**: *Alstonia scholaris*

**Classical Properties**

- **Rasa**: Kashaya.
- **Guna**: Snigdha, Ushna, Sara.
- **Dosha karma**: Kapha Vata Shamak.
- **Rogaghnata**: Agnideepak, Kushtha, Rakta Vikar, Krimi, Shwas, Gulma.

**MORPHOLOGY**

**Leaves**

Leaves are 4-7 in a whorl, bluntly acuminate, dark green on front and pale green beneath. The leaf stalk is 1-1.5cm long, the lamina is elliptical or elliptical-lanceolate, glabrous or sparsely
hairy, tapering towards the base, 11.5-23 x 4-7.5 cm in the size. The tip of the leaf is rounded or shortly pointed, tapering towards the base.\textsuperscript{[2]}

Flowers
The inflorescence is a much-branched terminal panicle, up to 120 cm long; flowers 7-10 mm long white, cream or green; the tube hairy; lobes sparsely or densely pubescent, 1.5-4 mm long, the left margins overlapping; strongly perfumed.

Fruits
Fruit of \textit{Alstonia scholaris} is a pendulous, two-lobed, dehiscent follicle, brown or green, dry or woody, spindle-shaped, 15-32 cm long, 4-6 mm in diameter, containing numerous flat, oblong, brown seeds, 4-5 x 0.9-1.2 mm, with a tuft of hairs 7-13 mm long at each end. The seed does not taper to a point at either end.

NATIVE
India, Bangladesh, China, Brunei, Cambodia, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam, Indonesia, Laos, Papua New Guinea, Philippines, Solomon Islands, Australia

Biochemical constituents
More than 300 compounds have been isolated and characterized in the phytochemical analysis of \textit{Alstonia scholaris}. The chief chemical constituents belong to the groups of alkaloids, iridoids, coumarins, reducing sugars, phenolics, flavonoids, leucoanthocyanines, steroids, tannins and saponins.\textsuperscript{[3]}

Antipsychotic activity
Multiple neurotransmitter systems including dopamine, serotonin, g-aminobutyric acid (GABA) and glutamate are associated with the abnormalities in various Psychosomatic disorders. Innovative therapeutic strategies comprise of regularization of synaptic dopamine or serotonin levels, serotonin receptor antagonism and modulation of cerebral protein synthesis.\textsuperscript{[4]}

An alkaloid from \textit{Alstonia scholaris} named alstonine shows a clear, dose-dependent (inverted U shape), potent antipsychotic profile\textsuperscript{[5]} in mice models. Alstonine (i.p.) prevented amphetamine-induced lethality, with active doses within the range of 0.5–2.0 mg/kg following an inverted U shape dose–effect relationship. This pattern has not been testified for
any other antipsychotic drug; this unique pattern claims in favour of a multiple mechanism of action, a complex interaction with more than one neurotransmitter system.\textsuperscript{[6]}

**Anxiolytic and Antidepressant Properties**

Symptoms of anxiety are very common, and thought to accompany many disorders, including mild cognitive impairment and Alzheimer’s Disease. Antipsychotic therapy reduces anxiety related with mitigation of the psychosis. Alstonine possesses clear anxiolytic activity, mediated by 5-HT2A/2C serotonin receptors, suggesting effectiveness against negative symptoms of mental disorders\textsuperscript{[6]}

Ethyl acetate from Alstonia scholaris leaves possesses anti anxiety and antidepressant activities. The apparent mechanism was found to be selective serotonin reuptake inhibition.\textsuperscript{[7]}

**Anti oxidant and free radical scavenging property**

*Alstonia scholaris* acquire powerful in vitro antioxidant activity. Various in vitro antioxidant tests carried on the plant proved that it is a potent reducing agent, metal chelator, hydrogen donor and scavenger of hydrogen peroxide, superoxide and free radicals.\textsuperscript{[7]}

*Alstonia scholaris* at the concentration of 200µg/ml displayed significant \(^{\cdot}\text{OH}\) radical scavenging potential and a resulting in maintenance of the integrity of Form I DNA.\textsuperscript{[8]}

**Anti acetylcholine esterase activity**

An experiment done by Kumar et al in 2003\textsuperscript{[9]} reveals that *Alstonia scholaris* has strong In vivo and In vitro inhibitory effect on acetylcholine esterase of *Lymnaea acuminate*. The inhibition of AChE activity was found to be both concentration and time dependent. The enzyme acetylcholine esterase occurs in the outer basal lamina of nerve synapses, neuromuscular junction and in certain other tissues. It is responsible for termination of cholinergic impulses by the hydrolysis of ACh, released during synaptic transmission; inhibition of AChE thus permits accumulation of ACh at the synapses which concentration rises several folds in comparison to normal levels leading first to paralysis and then death. Results obtained from present study indicate that the aqueous and partially purified both extracts of this plant inhibit the acetylcholine esterase activity in *L. acumina* in dose depedent manner.
Other Properties
Alstonia scholaris is known to possess hepatoprotective activity\(^\text{[10]}\), anti diabetic and anti hyperlipidemic activity\(^\text{[11]}\), antibacterial activity\(^\text{[12]}\), anticancer activity\(^\text{[13]}\), antiasthmatic and expectorant activity\(^\text{[14]}\) and antidiarrhoel and spasmyloytic activity\(^\text{[15]}\). The methanolic extract of the leaves possess antiplasmodial activity\(^\text{[16]}\).

Ayurvedic references
Saptaparna is mentioned for external application in skin diseases (Ch.Su.3/4), Kushthaghna Mahakashay (Ch.Su.4/13), Urticaria (Ch.Su.4/43), Santarpan Janya Roga (Ch.Su.23/10), Tikta skandh and as a Shirovirechan Dravya, (Ch.Vi.8/143, 151) It has been described for the treatment of Kaphaj Prameha (Ch.Ci.6/29) It is an ingredient of Mahatitkak Ghrita to treat Kapha Raktaj Vikara including Pandu and Hridroga (Ch.Ci.7/150), ingredient of Mahakhadir Ghrita (Ch.Ci.7/156), ingredient of Mahapanchagavya Ghrita- in the treatment of Apaasmara, Unmaad, Shotha and other Srotorodhajanya disorders, an ingredient of Chandanadi Ghrita in treatment of Grahani (Ch.Ci.15/128) and so many other diseases. We can see that Saptaparna is an ingredient of Brahmi Ghrita (As.Hr.Ut. 6/23- 23), having indication in Unmaad.

In Ayurveda although there is no direct reference of *Alstonia scholaris* acting as nootropic agent but it has been mentioned in treatment of Unmaad and Apasmara where there is predominance of Kapha and Rakta Dosha and purification of micro channels are required. From the different references we can conclude that Saptaparna can be used in diseases having Tridosha Pradhan Srotorodhatmak pathogenesis, including neuro psychological diseases.

DISCUSSION
Saptaparna is classically mentioned for the treatment of Kushtha, Rakta Vikar, Krimi, Shwas and Gulma but after the detailed study about its formulations and indications, we can say that it mainly acts on Kapha Vata Pradhan Srotorodhatmak Samprapti including pathologies like Dementia. It is a drug of rare combination of properties having Kashaya Rasa, Snigdha-Ushna- Sara Guna Agnideepak and KaphaVata Shamak property. Usually Kashaya Rasa is Stambhak, Ruksha and Sheeta but Saptaparna is Sara, Snigdha and Ushna. Correlating the Ayurvedic pathogenesis of Dementia, it appears that disturbance in the natural course of Vata and accumulation of Kapha due to Dhatwagnimandya (Majja) is responsible for Srotorodhatmak Kshaya and accumulation of Aam (Neurofibrillary Tangles and Tau proteins) that leads to degeneration and death of neurons resulting to Dementia. Saptaparna, due to its peculiar properties like Ushna and Sara Guna increases Dhatwagni leading to...
digestion of Aam (NFTs and Tau) give nutrition to neurons by Snigdha Guna and decreases the secretion of beta amyloid by Kashay Rasa. Beta amyloid is derived from the breakdown of APP, and is a prominent component in the senile plaques found in the brain of patients of AD and usually found in the walls of cerebral blood vessels. Normally, a protease called \(\alpha\) secretase cleaves the membrane bound APP into a large soluble part and a smaller membrane bound part. Further, this membrane bound part is cleaved by \(\gamma\) secretase and there is the production of less soluble A\(\beta\) peptides, which tend to cluster into amyloid fibrils. Kashay Rasa may reduce the production of beta amyloid peptide thus increasing the activity of alpha secretase\(^{[17]}\). The combined effect may result in normalizing of the Dosha imbalance on one hand and reversing the pathology of Dementia on the other hand.

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