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# PHYTOCHEMISTRY OF *ALSTONIA SCHOLARIS*: A REVIEW

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## ABSTRACT

*Alstonia scholaris* (Family Apocynaceae) is commonly known as Devil tree or Saptaparni. It is an evergreen tropical tree native to Indian sub-continent and South East Asia. It has a rough greyish bark and a milky sap rich in poisonous alkaloids. The plant is traditionally used by many ethnic groups as a remedy for treating various ailments. It is reported to contain various types of alkaloids, triterpenoids, flavonoids, steroids and phenolic acids. However, few reports are available regarding the scientific standardization and pharmaco-botanical parameters. This review compiles reports on the phytochemical aspects of *Alstonia scholaris*.

**KEYWORDS:** *Alstonia scholaris*, Apocynaceae, Devil tree, Phytochemistry.

## INTRODUCTION

Plant derived substances are of great interest owing to their versatile applications. Thus focus on plant research has increased all over the world. *Alstonia scholaris* (Family: Apocynaceae) popularly known as “Devil’s tree” or “Saptaparni” also invites attention of researcher’s for its pharmacological activities. The plant is used in Ayurvedic, Unani, Homeopathy and Folklore system of medicine to treat various types of disorders.[1,2]

*Alstonia scholaris* is an evergreen tropical tree native to Indian sub-continent and South East Asia, having greyish rough bark and milky sap rich in poisonous alkaloid.[3-8] In “India, it is widely distributed in Western Himalayas, dried forests of India, Western Ghats and the Southern region.[9]

**Pharmacognostic features**

It grows up to 17–20 m in height, with a straight often fluted and buttressed bole, about 110 cm in diameter. Bark is greyish brown, rough, lenticellate abounding, bitter in taste secreting white milky latex. Leaves are 4–7 in a whorl, coriaceous, elliptic-oblong. Flowers are small, greenish white, many in umbellate panicles; corolla tube is short, very strongly scented. Fruits have follicles, 30–60 cm long. Seeds are papillose with brownish hair at each end.[10]

**Folkfore uses**

The bark, also called Dita bark, is traditionally used by many ethnic groups of North East India and other parts of the world as a source cure against bacterial infection, malarial fever, toothache, rheumatism, snakebite, dysentery, bowl disorder, etc. The bark is the most intensively used part of the plant and is used in many compound herbal formulas.[10] Also, the latex is used in treating coughs, sores and fever.[10,11,12] The ripe fruits of the plant are used in syphilis and epilepsy. It is also used as a tonic, antiperiodic and anthelmintic. Its milky juice has been applied to treat ulcers.[10,13] The leaf extract has also been found to own antimicrobial properties.[14] *A. scholaris* (L.) R.Br has also been reported to inhibit liver injuries induced by carbon tetrachloride, beta-D-galactosamine, acetaminophen, and ethanol as remarked by the reduced elevation of levels of serum transaminases and histopathologic changes such as cell necrosis and inflammatory cell infiltration.[15]

**PHYTOCHEMISTRY**

Analysis of phytochemical constituents has been reported by many authors.[16-31] *Alstonia scholaris* is known to be a rich source of alkaloids (about 180 alkaloids).[32-41] Constituents have been reported from different parts of the plant such as bark;[42-46] leaves;[47-55] roots;[56] flowers[57] and fruits.[58]

Among different alkaloids,[59] Echitamine,[42,43,60] Echitamine chloride, Rhazine, Nareline[50,51] and Pseudo Akuammigine from the bark of the plant; Scholarine, Scholaricine (an anilinoacrylate alkaloid) from the leaves of *Alstonia scholaris*;[61,62] 19, 20-Dihydrocondylocarpine;[49] 19, 20-Z-Vallesamine and 19, 20-E-Vallesamine;[63] Picrinine,[64] Alschomine[50,51] and Isoalschomine; 17-0- Acetylechitamine;[50,51] Mataranine A and B; monoterpenoid indole alkaloids;[65,66] Picralinal of picralima group;[67] Picrinine-type alkaloids;(54) $N^1$-methoxymethyl Picrinine[68] etc have been reported.

The bark contains alkaloids like corialstonine and corialstonidine[69] while bark along with leaves contain alkaloids such as L-agumamine (19 - hydroxytubotaiwine), angustilobine B-acid, losbanine (6,7-seco-6-nor-angustilobine B), tubotaiwine, its oxide, 6,7-secoangustilobine B; 17-0-Acetyl echtamine.[51]

The phytochemical analyses of chloroform faction of 85% ethanolic extract of *A. scholaris* showed the presence of echitamidine-N-oxide-19-O-β-D-glucopyranoside, an indole alkaloid.[70]

Isolation of a new secoiridoid glucoside alstonoside, together with two known isoflavone apioglucosides, formononetin 7-0-β-D-apiofuranosyl(1-6)-β-D-glucopyranoside and biochanin α-7-0-β-D apiofuranosy–(1-6)-β-D- glucopyranoside has been reported.[71]

Among the other constituents, Isookanin-7-o-alpha-l-rhamnopyranoside, a new flavanone glycoside[71] and Alstonoside, a secoiridoid glucoside[72] has been recorded. Iridoids, coumarins, flavonoids, leucoanthocyanins, reducing sugars, simple phenolics, steroids, saponins and tannins were also found in the plant[28]. Presence of α-amyrin, β-amyrin, lupeol acetate, venenative, rhazine and yohimbine have been noted,[45] Linalool, cis- and trans-linalool oxides (furanoid and pyranoid), alpha-terpineol, 2-phenylethyl acetate and terpinen-4-ol[73] and steroids[74] are among the other phytoconstituents of the species.

In another study, unusual 2, 3-secofernane triterpenoids, Alstonic acids A and B were found.[67] Three new triterpenoids, two of the ursane type, 3β -acetate- 24-nor-urs-4,12-diene ester triterpene and 3β -hydroxy-24-nor-urs- 4,12,28-trienetriterpene, and one of the oleanane type, 3,28-β -diacetoxy-5-olea-triterpene and two triterpenes, α-amyrin acetate and ursolic acid have also been recorded.[75]

Ursolic acid (pentacyclic triterpene acid),[76] lupeol acetate,[77] flavonoids;[78] monoterpene,[79] triterpene;[67,74,80] iridoids[81] have been reported from the plant.

Apart from those, two C13-norisoprenoids namely megastigmane-3β,4α,9-triol,7-megastigmene-3,6,9-triol,[82] C13-norisoprenoid[82] have been found.

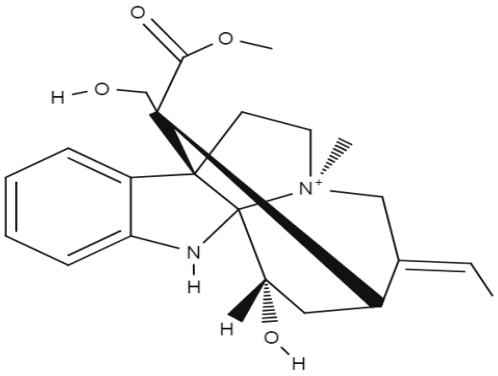
Four alkaloids were identified in the base fraction of *Alstonia scholaris* (L.) R. Br. leaves, namely Akuammidine, Nicotine, Strictamine, and Voacristine through GC-MS analysis.[83]

The dichloromethane extract of the leaves of *Alstonia scholaris* has shown the presence of erythrodiol, uvaol, and betulin, oleanolic acid and ursolic acid, β-amyrin acetate and α-amyrin acetate and β-sitosterol and stigmasterol; squalene, β-sitosteryl-3β-glucopyranoside-6′-O-fatty acid esters, and chlorophyll a.[83]

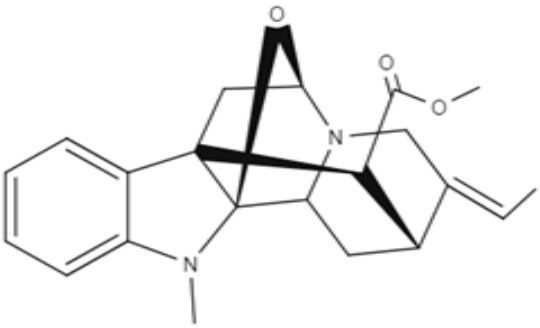
Total phenolics, flavonoid and tannin contents were found to be significantly ($P<0.05$) higher in ethanolic extracts of *Astonia scholaris*.[84,85]

## CONCLUSION

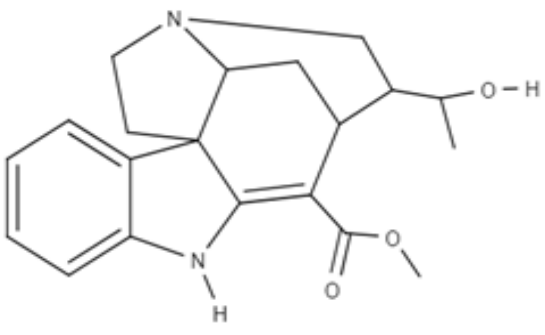
*Alstonia scholaris* is known to be a rich source of various phytoconstituents like alkaloids, flavonoids, tannins, terpenoids, etc so there is an interest among scientists to use these for therapeutic purposes. Almost all parts of the plant have been found to contain the active constituents. Also the traditional use of this plant has been validated by several pharmacological investigations. There is an opportunity to explore the plant species, both phytochemically and pharmacologically. This will act as a bridge between the folklore use and actual pharmacological efficacy of the plant and can be used in novel drug discovery programs.



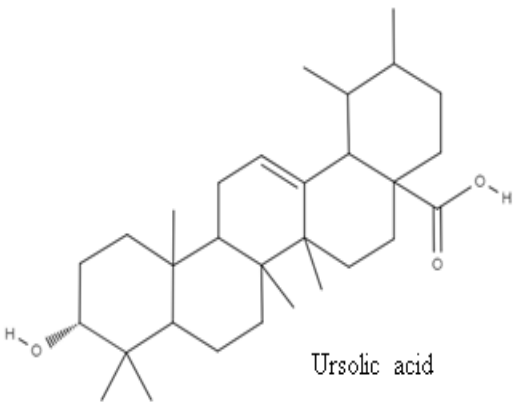
**Echitamine**



**Picrinine**

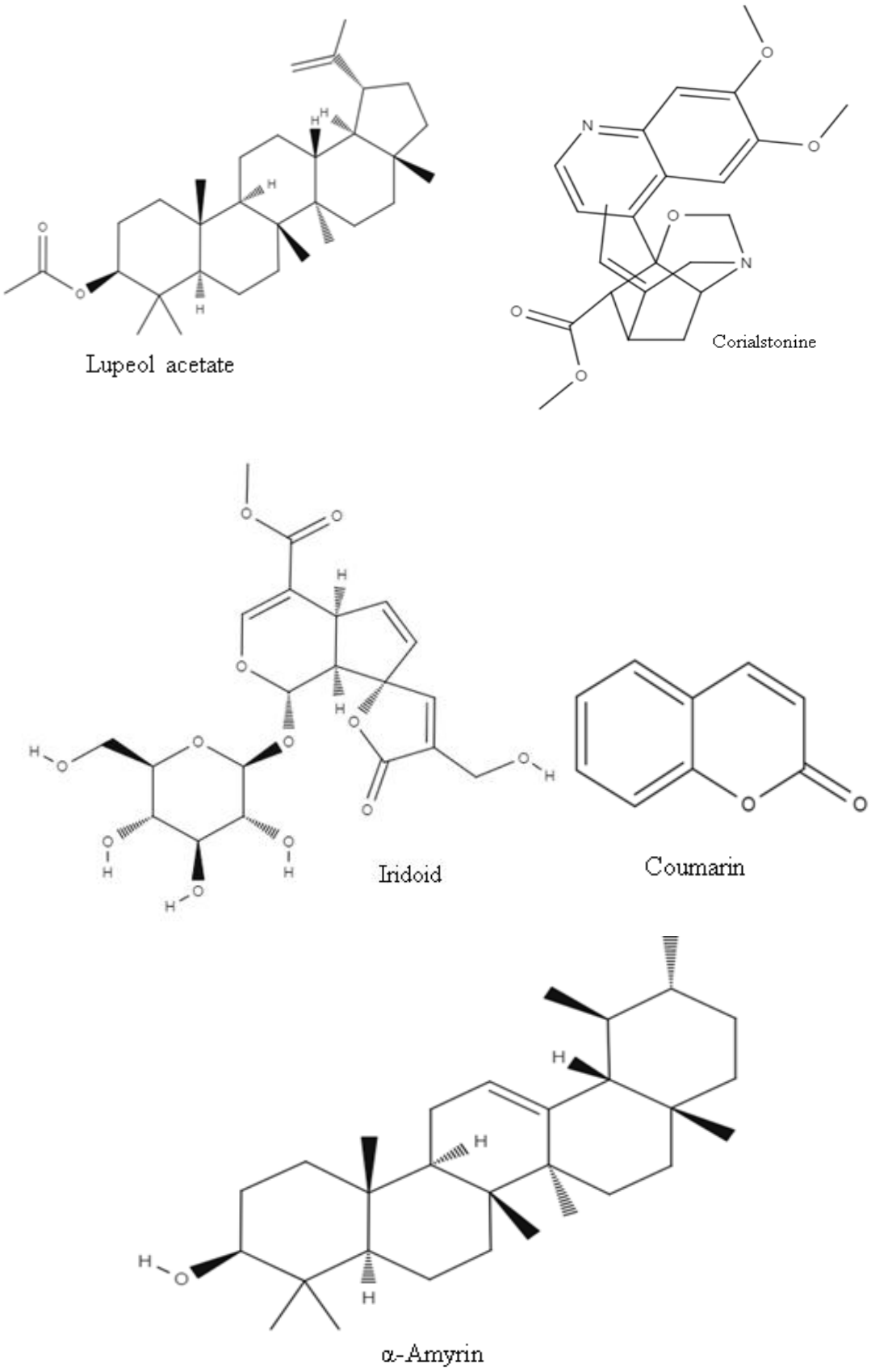


Scholaricine



Ursolic acid

**Structures of few chemical constituents present in *Alstonia scholaris.***




**Structures of few chemical constituents present in *Alstonia scholaris*.**

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