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# Pharmacological Activities and Phyto-chemistry of Alstoniascholaris

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***Abstract***

*Alstoniascholaris is a widely used plant in traditional medicine for various diseases and ailments.it has pharmacological properties beneficial to human health,it extract showed anti-stress, anti-oxidant, nootropic, cytotoxic, anti-cancer and anti-malarial effect. It also has anti-anxiety, anti-diabetic, antibacterial, anti- asthmatic, hepatoprotective anti-inflammatory and wound healing properties. Phyto-chemical investigation reveals presence of alkaloids, flavonoids, terpenoids, glycosides and phenolic acid. Methanol extract of Alstoniascholaris’ flowers shows powerful antioxidant activity than fruits. The leaves are used for diahhroea, dysentery, malaria and snake bites.*

***Keywords:*** Alstonia macrophylla, Alstoniascholaris, broncho-dilatory.

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## Introduction:

*Alstoniascholaris*, commonly called *blackboard tree, scholar tree, milkwood* or ***devil's tree*** in English, is anevergreentropical tree in the Dogbane Family (Apocynaceae). It is a versatile medicinal plant with wide biological activity. It is native to southern China, steamy Asia (chiefly the Indian subcontinent and SoutheastAsia) and Australasia, where it is a common ornamental plant.It was named by Robert brown in 1811, later Charles Alston (1685-1760), professor of botany at Edinburgh from 1716 to 1760. The type species alstoniascholaris (L.) R.Br. was initially named Echitesscholaris by linnaceus in 1767. *Alstonia* trees are used in traditional medicine. bark of *Alstoniaconstricta*and *Alstoniascholaris* is the basis of a remedy against malaria, toothache, rheumatism and snake bites. The latex is used in treating coughing, oesophagus sores and fever. *Alstoniascholaris* is a tree that grows up to 40 m (130 ft) tall.Its matured bark is grayish, and its young branches are copiously marked with lenticels. Aexceptional feature of this tree is that in some places, such as New Guinea, the trunk is three-sided (i.e. it is triangular in cross-section). The larger side of the leaves are smooth, while the underside is greyish.Leaves occur in whorls of three to ten; petioles are 1–3 cm (0.39–1.18 in); the leathery leaves are narrowly obovate to very

narrowly spathulate, base cuneate, apex usually rounded and up to 23 cm (9.1 in) long by up to 8 cm (3.1 in) in width.Lateral veins occur in 25 to 50 pairs, at 80–90° to midvein. Cymes are dense and pubescent; peduncle is 4–7cm (1.6–2.8 in) long. Pedicels are habitually as long as or shorter than calyx. The corolla is white and tube-like, 6–10 mm (0.24–0.39 in); lobes are broadly ovate or broadly obovate, 2–4.5 mm (0.079–0.177 in), overlapping to the left. The ovaries are distinct and pubescent. The follicles are distinct and linear. Flowers bloom in the month of October. The flowers are very fragrant similar to the flower of *Cestrumnocturnum*. Seeds of *A. scholaris* are oblong, with ciliate margins, and ends with tufts of hairs 1.5–2 cm (0.59–0.79 in). The bark is almost odourless and very bitter, with abundant bitter and milky sap. This is a toxic plant. At high doses, an extract of the plant exhibited marked damage to all the major organs of the body in both rats and mice. The toxicity seems to depend on the plant organ considered, as well as the season it is harvested, with the bark collected in the monsoon season being the least toxic, and bark in the summer the most. Intraperitoneal administration is much more toxic than oral administration. Rats stayed more susceptible to the poison than mice, and pure-bred mice strains were more susceptible than crossbred.

This toxic effect may be due to echitamine content of the bark, alkaloids.

## Local name

**English:** (whitecheesewood, birrba, milkwood pine, milky pine, blackboard tree, devil’s tree, dita bark)

phytochemical investigation reveals presence of alkaloids, flavonoids, terpenoids, glycosides and phenolic acid. Coumarins, leucoanthocyanins, reducing sugars, steroids, saponins and tannins. Leaf extract contain the eight elements such as copper, zinc, iron, calcium, chromium, manganese and cadmium.[5] the alkaloid fraction of alstoniascholaris has been found to have antimalarial, anxiolytic, antipsychotic and anticancer activities. The hydro-alcoholic extract of alstoniascholaris has shown chemo preventive effect against fore stomach carcinoma in mice.[17]

## Taxonomy

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| Taxonomy Alstoniascholaris |
| Kingdom Plantae, Planta |
| Subkingdom Tracheobionta, vascular plants |
| Division Magnoliophyta, Flowering plants |
| Class Subclass Magnoliopsida, Dicotyledon |
| Order Gentianales |
| Family Apocynaceae |

**Antioxidant activity:**

Methanolic extract of Alstonia Scholaris bark has anti-stress, antioxidant, and nootropic activities. The fruit extract also showed antioxidant activity but lower than flower extract. The presence of phytochemicals like flavonoids and polyphenolic compounds contributed to the antioxidant activity.[9]

## Antiulcer activity:

Ethanolic extract of leaves of Alstoniascholaris was evaluated for antiulcer activity in pyloric ligation method. The animals treated with the extract didn’tdisplay ulcer, whereas the ulcer score was found to be significantly high (p<0.01) in rats administered diclofenac sodium.[15]

## Analgesic and anti-inflammatory activity:

Methanol extract of flowers and fruits of Alstoniascholaris showed analgesic and anti- inflammatory effects. Presence of flavonoids, terpenoids, alkaloids, and glycosides may be responsible for the activity.[14]

**Hindi:** (chatian, satni, satwin, shaitan ki jhad)

**Urdu:** (chatiana)

**Gujrati:** (satuparni)

**Trade name:** (pulai, shaitan wood, chatiyan wood)

## Photochemistry:

**Traditional uses:**

Alstoniascholaris has been used in traditional medicine for various ailments. Traditional uses include treating cardiovascular problems, liver disorders, and digestive issues. It is also used as a remedy for snake bites and scorpion bites. The plant is used in Ayurveda for its febrifuge and tonic properties. In Unani medicine, it is an ingredient in the preparation called 'Kashim'. Homoeopathy uses it for treating malarial fever, anaemia, and stomach ailments.[1]bark is used for malarial fever, abdominal disorders and skin diseases, leaves are used for asthama and rheumatic conditions.[11]

## Morphological characteristics:

Alstoniascholaris is an evergreen tree &It can grow up to a hundred meters in height. It has white- coloured flowers. Leaves: Arranged in a whorled pattern. Tree: Medium-sized with a dense crown. Flowers: Small, white, and fragrant.[1]

## Pharmacological activity:

**Antipyretic activity:**

The methanol extract of the flower and fruits showed significant anti pyretic activity.[8]

## Immunomodulatory activity:

It has anti-plasmodial, hepatoprotective, and immunomodulatory properties. Alstoniascholaris bark extracts have immune-stimulating effects. Aqueous extract at 100mg/kg increased lytic activity against Escherichia coli. Aqueous extract at 50 mg/kg induced cellular immune response.

## Terato-genicity:

Hydro-alcoholic extract of Alstoniascholaris showed terato-genic effects at higher doses. Doses above 240 mg/kg resulted in mortality, growth retardation, and congenital malformations. Lower doses (up to 240 mg/kg) did not cause developmental toxicity.[15]

## Anti-fertility activity:

Alstoniascholaris bark extract showed significant antifertility effect in male rats. The extract reduced the production of spermatids and spermatocytes. It also affected the population of spermatogonia and Sertoli cells. The extract decreased the size and content of reproductive organs. Lupeol acetate isolated from the extract further enhanced the antifertility effect.[2]

## Anti-sthamatic activity:

Alstoniascholaris leaves have Broncho vasodilatory activity and its extract interferes with the influx of calcium ions into cells. Alstoniascholaris leaves possess broncho-vasodilatory activity medicated by prostaglandins calcium antagonism and endothelium-derived relaxing factor(s). Extract reduces contraction induced by barium chloride, potassium chloride and calcium chloride. Vasodilatory activity is independent of adrenergic or muscarinic receptors.[18]

## Free radical scavenging activity:

Alstoniascholaris extracts showed significant free radical scavenging activity. Alstoniascholaris bark showed the greatest NO scavenging effect.Extract showed significant antioxidant activity by inhibiting DPPH and superoxide production. Presence of flavonoids contributes to free radical scavenging activity. Aqueous extract of bark exhibited the highest antioxidant activity in DPPH and ABTS assays. Fraction from ethanolic extract of leaves showed various free radical scavenging activities. Methanolic extract of fruit and flower also exhibited antioxidant activity.[14]

## Hepatoprotective activity:

The hepatoprotective effect of Alstoniascholaris R. Br. on liver injuries induced by carbon tetrachloride (CCl4), β-Dgalactosamine, acetaminophen and ethanol was investigated by Lin et al by serum- biochemical and histopathological examinations. It improves the function of hepatocytes.it decreases biochemical parameters like SGOT, SGPT, ALP, TP, and TB.[14]

## Anticancer activity:

Anticancer activity of A. scholaris extracts investigated on various carcinomas. Methanol extracts of root barks of Alstonia macrophylla, A. glaucescens, and A. scholaris have been assessed for cytotoxic activity against lung cancer cell lines.Flavonoids and polyphenolic compounds in the plant parts show anti-cancer activity.[17]

## Anti-diarrhoeal activity:

A. scholaris has been used as an antidysentery agent. Used in the treatment of stomachache and urinary tract infections. Alstoniascholaris has been

used in traditional medicine for treating dysentery. The plant contains chemical constituents that have astringent properties. The plant has not been specifically mentioned to have antidiarrheal properties.[17]

## Antimicrobial activity:

Butanol fraction of crude methanolic extracts exhibited broader spectrum of antibacterial activityand also active against Active against Gram positive bacteria (Bacillus coagulans). Active against Gram negative bacteria (Escherichia coli). The flower, root, stem, bark, and leaves of Alstoniascholaris possess powerful antibacterial activity.[14]

## Antidepressant:

Methanolic bark extracts showed antidepressant effects on stress and cognition. Leaves of Alstoniascholaris have antidepressant activity.[3]

## Anti-diabetic activity:

Ethanolic extract of A. scholaris has antidiabetic activity in diabetic rats. Leaf powder of A. scholaris decreases blood glucose levels in humans. Alstoniascholaris bark extract shows potential in the treatment of diabetes mellitus. Aqueous extract of bark of Alstoniascholaris shows anti-diabetic effects. Phytochemical like Alkaloids, tannins, flavonoids, saponins, glycosides, and triterpenoids in Alstoniascholaris bark indicate potential for treating diabetes mellitus. Alstoniascholaris bark extract shows antihyperlipidemic effect in diabetic rats.[3]

## Anti-depressant activity:

Alstoniascholaris methanolic bark extract normalized stress-induced indicators in mice.[3]

## Anti-bacterial activity:

Methanolic extract of the A. scholaris bark was found to be active on Gram positive bacteria i.e. Bacillus Coagulans and gram-negative bacteria i.e. Escherichia coli.[1]

## Ameliorating effect:

The study highlights the potential of aqueous Alstoniascholaris bark extract in mitigating the harmful effects of viper venom on liver and kidney tissues. The polyphenols in the extract may play a crucial role in this protective mechanism.[2]

## Antitubercular activity:

The methanolic extract from the leaf, bark, stem and root bark of Alstoniascholaris have demonstrated antitubercular activity. These extract exhibit the potential to combat tuberculosis, a

significant infectious disease caused by the bacterium mycobacterium tuberculosis.[2]

## Conclusion

Alstoniascholaris is an evergreen tree used in traditional medicine. Alstoniascholaris has various pharmacological activities, including antimicrobial, antioxidant, and anti-inflammatory effects. The plant contains alkaloids, flavonoids, and phenolic acids. It has been used in traditional medicine for cardiotonic, anti-diabetic, and anti-arthritic properties. Alstoniascholaris has shown antimutagenic and radio sensitizing effects in studies.The plant extract has demonstrated anticancer and antifertility effects in animal models. Higher doses of the extract can cause teratogenic effects in pregnant mice. The bark extract has immune-stimulating and anti-asthmatic activities.

## References

1. M.M\*, H. b., Bhattacharjee2, A., Hegde3, K., & Shabaraya4, D. (2019). Alstonia Scholaris: A Brief Review. *International Journal of Pharmaceutical Sciences Review and Research*, 31-33.
2. ARORA, A., & RAI, Y. (2015). A Review:

Phytochemictry, Ethanobotanical and Pharmacological activities of Alstonia scholaris R.Br (Apocynaceae). *INTERNATIONAL JOURNAL OF ADVANCED RESEARCH, 3*, 584-590.

1. Chhajed, M., Jain, A., Pagariya, A.,

Dwivedi, S., Jain, N., & Taile, V. (2023). Alstonia scholaris Linn. R. Br.: An Assessment of its Botany, Conventional Utilizaton, Phytochemistry and pharmacology. *Pharmacognosy Reviews, 17*, 184-203.

1. Dangi, R., Jain, N. k., & Shaikh, A. (2018). Immunomodulatory Activity of Different Extracts of Stem Bark of Alstonia scholaris Linn. *Journal of Drug Delivery and Therapeutics*, 106-110.
2. dey, A. (2011). Alstonia scholaris R.Br. (Apocynaceae): Phytochemistry and pharmacology: A concise review. *Journal of Applied Pharmaceutical Science*, 51-57.
3. Ganjewala\*, D., & Gupta, A. K. (2013). Study on Phytochemical Composition, Antibacterial and Antioxidant Properties of Different Parts of Alstonia scholaris Linn. *Advanced Pharmaceutical Bulletin*, 379-384.
4. I, A., A, S. N., & Naik, J. N. (2016). ANTI HYPERGLYCEMIC ACTIVITY OF ETHANOLIC LEAF EXTRACT OF

Alstonia scholaris (L) IN INDUCED DIABETIC RATS. *Journal of Global Biosciences, 5*, 4535-4540.

1. James, J., Misra, C. S., Pratyush, K., Thaliyil Veettil, A. K., Sahadevan, L. m., & V, T. (2012). Pharmacological evaluation of plant extracts of Alstonia scholaris for its analgesic and anti pyretic activity. *Journal of Pharmacy Research, 5*, 3500-3502.
2. James, j., Thaliyil Veetti, A. k., Pratyush, k., misra, c. S., Sahadevan, L. M., & V1\*,

T. (2011). in vitro antioxidant activity of flowers and fruits of alstonia scholaris. *International Journal of Phytomedicine*, 475-479.

1. KANASE\*, V., & MANE, D. (2019). EVALUATION OF ANTIPYRETIC AND ANTIULCER ACTIVITY OF ETHANOLIC EXTRACT OF LEAVES OF ALSTONIA SCHOLARISL.IN

ALBINO WISTAR RATS. *Asian Journal Pharmaceutical and Clinical Research, 12*, 203-208.

1. Mishra, M., Mishra, R., Mishra, S.,

Verma, S. K., & Tyagi, N. (2020). PHARMACOGNOSTIC AND PHARMACOLOGICAL ACTIVITY OF ALSTONIA SCHOLARIS: A REVIEW.

*Journal of Emerging Technologies and Innovative Research, 7*, 985-996.

1. pankti , k., payal, g., manodeep, c., & jagadish, k. (2012). A phytopharmacological review of alstonia scholaris: a panoramic herbal medicine. *kalaria pankti*, 367-371.
2. Patil, M. B. (2019). Ethnomedicine, Phytochemistry and pharmacology of Alstonia scholaris R.Br. (Apocynaceae): A review. *International Journal of Life Sciences Research, 7*, 25-39.
3. Prakash\*, D., Bisht, D., & Shakya, A. k. (2020). Medicinal Properties and Phytoconstituents of Alstonia scholaris: A Review. *International Journal of Research, 11*, 1-10.
4. Pratap, b., Chakraborthy, G. S., & Mogha,

N. (2013). Complete Aspects Of Alstonia Scholaris. *International Journal of PharmTech Research, 5*, 17-26.

1. Pratyush, k., Misra, C. S., James, j., S, L.

M., Thaliyil Veettil, A. K., & v, T. (2011). Ethnobotanical and Pharmacological Study of Alstonia (Apocynaceae) - A Review. *Journal. of Pharmaceutical. Science. & Research, 3(8)*, 1394-1403.

1. s, A., Mazumder, P. m., Ashok, P., & Narayanan, S. L. (2007). PHCOG REV.:

Plant Review Pharmacological activities

of Alstonia scholaris linn. (Apocynaceae) - A Review. *Pharmacognosy Reviews, 1*, 163-170.

1. Swain, R. K., Dr Manisha, Indracanti, D., Padma, D., & Sarma, D. K. (2023). Studies on Anti-Asthmatic Activities in Alstonia Scholaris. *Eur. Chem. Bull*, 8017

- 8023.