Review Article

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REVIEW ON PHYTOPHARMACOLOGY OF *AZIMA TETRACANTHA* LAM PLANT (SALVADORACEAE)

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ABSTRACT

Medicinal Plants have played a central role in the prevention and treatment of diseases since prehistoric times. In recent years, there has been growing interest in the study of medicinal plants and their extensive use in different countries. However, today it is essential to pay for the scientific proof as to whether it is rational to use a plant or its active principles. Hence the present communication constitutes a review with adequate information on the medicinal properties, ethno-medicinal uses, phytochemistry, and pharmacological activities of an Indian medicinal plant, *Azima tetracantha* Lam belonging to the family of Salvadoraceae. A wide range of phytochemical constituents have been isolated from *A. tetracantha* Lam which possesses activities like as stimulant, expectorant, anti-asthmatic activity, antispasmodic, analgesic, anti-inflammatory, anti-ulcer, anti-diarrhoeal, insecticidal, anti-microbial, antivenom activity, hepatoprotective, nephroprotective, hypoglycemic and hyperlipidemic activities. Hence, extracts of *Azima tetracantha* could form one of the best options for developing novel natural medicine.

Keywords: *Azima tetracantha* Lam, Salvadoraceae, Medicinal plants, antispasmodic.

INTRODUCTION

Most of the natural products used in folk remedy have solid scientific evidence with regard to their biological activities. However, there is little information or evidence available concerning the possible toxicity that medicinal plants may cause to the consumers in relation to drug discovery and development, there are different weights of concern of all relevant groups such as health authorities, pharmaceutical industry, and patients which need to be taken into consideration¹.

Azima tetracantha (Salvadoraceae) is a well-known medicinal herb, termed 'Mulsangu' in Tamil and 'Kundali' in Sanskrit. Root, root bark and leaves of *Azima tetracantha* (Lam) are used with food as a remedy for rheumatism, diuretic and as stimulant. Traditionally Indian medical practitioners use *Azima tetracantha* (Lam) in inflammatory conditions, cough, asthma, small pox and diarrhoea^{2,3}. The major phytoconstituents reported in *Azima tetracantha* (Lam) are azimine, azecarpin, carpine, isorhamnitine-3-O-rutinoside, friedelin, lupeol, glutinol and β -sitosterol *Azima tetracantha* (Lam) is reported to have antifungal, anti-tumour, antidiabetic, anti-diarrhoeal and hepatoprotective activities.

Azima tetracantha (Lam) is a low, spinous, highly branched bush, woody below but with pale green, herbaceous, almost quadrangular young branches. The leaves are in opposite to sub-opposite, decussate pairs. They are shortly petiolate, about 2 x 4 cm long, entire, elliptic, acute, sharply mucronate, rigid, pale green with an acute base. Usually, there are two laterally placed spines in the axil of a leaf. The spines which morphologically represent the first pair of leaves of the auxiliary shoot are about three cm long, more or less, triangular in cross section, very sharp and with an indurate apex. The plant is dioeciously⁴. The flowers are borne in the axils of leaves. Generally, there is cymes of three flowers in the axil of a leaf which is the upper branches, especially

of the male plants become greatly reduced or even completely suppressed.

Besides efficacy, ethyl acetate extract of *Azima tetracantha* Lam should meet the safety requirement for its development as an alternative medicine. In this study acute and chronic toxicity test was carried out on the extract to explore its safety feature^{4,6}.

PLANT PROFILE

Plant name

Azima tetracantha Lam.

Synonyms

Monetia barlerioides, Kundali, *Kandena spinosa* Rafin, *Monetia aungustifolia* Boj

Taxonomy

Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Sub-class: Dilleniidae
Order: Brassicales
Family: Salvadoraceae
Genus: *Azima*
Species: *tetracantha*

Vernacular names

Telugu: Tella uppichettu
Tamil: Mulsangu
Kannada: Uppimullu

Ayurvedic medicine: Kundali

Malayalam: Esanku

English: Needle bush⁷⁻¹⁰

Distribution

Azima tetracantha Lam is a scrambling spinous shrub or small tree of about 5 m flowering throughout the year found in Peninsular India, West Bengal, Orissa, African countries and extends through Arabia to tropical Asia¹¹.

Description

Leaves

Oval to circular, opposite or nearly so, each pair at right angles to the previous and following one; light green, leathery and usually hairy; apex has a sharp tip, margin entire, tapering at both ends, short petiole^{12,13}.

Stem

Bark green on younger branches, turning brown, young twigs sometimes square in cross-section, hairy; characteristic whorls of four long straight spines occur along the length of branches at each of the leaf axils¹⁴.

Seed/Fruit

Round berry of 1cm diameter with a sharp apical tip; fleshy, light colored, containing one or two seeds; ripe from summer into the next winter.

Flowers

Dioecious; light green or yellow, small flower clusters in axils; floral parts in fours; petals recurving, calyx bell-shaped¹⁵⁻¹⁷.

Botanical distribution

Azima tetracantha Lam., belongs to Salvadoraceae and known as Kundali in Ayurvedic medicine. *Azima tetracantha* is a perennial shrub growing up to 3 m in hot, dry riverine scrub, particularly on alluvial or saline soil. The plant is dioecious, erect shrub with (1–) 2 spines 0.5–5 cm long in each leaf axil, sometimes scandent with stems up to 8 m long; branchlets are terete or quadrangular, glabrous to densely hairy. The leaves of the plant are elliptical in shape and are rigid, pale green colored. The flowers are small, greenish white (or) yellow colored, unisexual in axillary fascicles. Fruits are globular, white shiny. Seeds are compressed, circular.¹⁸⁻²⁰ It occurs naturally in central, eastern and southern Africa as well as in the Indian Ocean Islands and extends through Arabia to tropical Asia.²¹⁻²³

Plant – *Azima tetracantha* Lam

Figure 1: Spines

Figure 2: Leaves

Figure 3: Flowers

Figure 4: Fruits

Chemical constituents of *Azima tetracantha*

The plant contains alkaloids, flavonoids, sterols, terpenoids, volatile oil and fatty acids, saponins. A number of chemical constituents have been reported from the leaves (Friedelin, Lupeol, Glutanol and beta-sitosterol), the seed oils (fatty acids

such as myristic acid, palmitic acid, stearic acid, arachidic acid, oleic acid, linoleic acid, eicosenoic acid and flavonoids), the seed, root, stem and young leaves (N-methoxy-3-indolyl methylglucosinolate), roots and the leaves (terpenoids) also the dimeric piperidine alkaloids azimine, azcarpine and carpaine are present in all plant parts.^{6,7}

Class	Chemical constituents
Glucosinolates and glucosinolate derived compounds	3- indolylmethylglucosinolate N- hydroxyl- 3- indolylmethyl- glucosinolate N- methoxy- 3- indolylmethyl- glucosinolate Neoscorbigen
Dimeric piperidine alkaloids	Azimine Azcarpine Carpaine ^{6,7}

Traditional Uses

Traditionally, root used as diuretic. In Siddha, root is used in the treatment for dropsy and rheumatism. It is also used as analgesic and anti-inflammatory.

Leaves are used as stimulant, expectorant and antispasmodic. It is also used in cough and asthma. Bark is used as antiperiodic, astringent and expectorant.

In western India, juice of the leaves is applied as ear drops against earache and crushed leaves are placed on painful teeth.

In India and Sri Lanka, the root, root bark and leaves were administered with food as a remedy for rheumatism, dropsy, dyspepsia, chronic diarrhoea and is considered as stimulant tonic and given to pubertal women immediately after confinement.

Locally, the traditional healers from Tirunelveli district of Tamil Nadu use the root bark (paste with buttermilk) as potent remedy for jaundice.²⁴⁻²⁶

Medicinal uses

- The juice of the leaves is used to relieve the cough phthisis and asthma.
- Juice of the leaves is applied as eardrops against ear ache and crushed leaves for painful teeth.
- The root, bark and leaves are administered with food as a remedy for rheumatism
- As a powerful diuretic and also to treat dropsy, dyspepsia, chronic diarrhea.
- As a stimulant tonic in pubertal women immediately after confinement.
- The leaves of this plant possess anti-inflammatory, anti-ulcer and analgesic activity.
- Anti-bacterial and anti-fungal properties.
- Bark is used as antiperiodic, astringent, expectorant.
- Leaves are used to the stimulant, expectorants, antispasmodic, and also used in cough and asthma.
- The root bark (paste with butter milk) potentially remedies for jaundice.⁷⁻⁹

Pharmacological activities of *Azima tetracantha* Lam

The plant *Azima tetracantha* have a wide range of pharmacological activities, such as anti-asthmatic activity, antiarthritic activity, anti-inflammatory, antivenom, anticonvulsant activity, antiquorum sensing activity, hepatoprotective activity, antimicrobial activity, cytotoxic and anticancer activity, antipyretic activity, antiulcer activity, insecticidal activity, analgesic.

Antidiarrheal Activity

Azima tetracantha Lam possesses antidiarrheal property^{27,28}.

Antiquorum sensing Activity

Azima tetracantha Lam have reported Antiquorum-sensing activity by inhibition of the violacein in the production of *Chromobacterium violaceum*.^{29,30}

Antiepileptic Activity

Azima tetracantha Lam has reported for its Antiepileptic activity with marked seizure protection³¹.

Hepatoprotective activity

Azima tetracantha possesses hepatoprotective activity and has a significant reduction in the biochemical parameters of liver damage glucose, protein, bilirubin, cholesterol, ALP, SOD, CAT, Vitamin E, TBARS, Albumin and globulin. It also restores the levels of SGOT, SGPT, LDH, SOD, catalase (CAT), reduced glutathione (GSH) and glutathione peroxidase (GPx)³²⁻³⁴.

Anti-asthmatic Activity

The leaves of *Azima tetracantha* have been reported for anti-asthmatic activity by inhibiting mast cell degranulation in a dose dependent manner³⁵.

Antiulcer Activity

Azima tetracantha possesses antiulcer activity and shown positive results for various biochemical parameters.³⁶

Nephroprotective Activity

Azima tetracantha have shown nephroprotective activity by ferrous sulfate-induced renal injury model in rats. Ferrous sulfate was found to cause a rise in the level of electrolytes and kidney markers. Administration of the leaf powder significantly restored the levels of potassium, chloride, bicarbonate, creatinine, urea, and CGT indicating nephroprotective potential of the plant³⁷.

Anti-arthritis Activity

Azima tetracantha reported for antiarthritic activity³⁸, with decreased levels of Rheumatoid factor and C-reactive protein.

Insecticidal Activity

Azima tetracantha reported for insecticidal activity with positive results³⁹.

Analgesic Activity

Azima tetracantha was reported for significant analgesic activity equivalent to that of morphine sulfate.^{41,42}

Anti-inflammatory Activity

The anti-inflammatory activity of *Azima tetracantha* leaf powder was studied against acute inflammation and chronic inflammation. *Azima tetracantha* suppress the transudative,

exudative, and proliferative components of chronic inflammation. In addition, it lowers the lipid peroxide content of exudate and liver, γ -glutamyl transpeptidase activity⁴³.

Antipyretic Activity

Azima tetracantha is also reported for antipyretic activity^{44,45}.

CONCLUSION

The information summarized here is well intentioned to serve as a reference tool to researchers in the field of ethnopharmacology of *Azima tetracantha*. Based upon the literature survey, it can be concluded that *Azima tetracantha* has been widely studied for its pharmacological activities. Science has always acknowledged the value of healing substances found in nature, such as digitalis, aspirin, penicillin, insulin, steroids etc. There is no doubt that valuable medicinal shrub, *Azima tetracantha* will be a treasure and will top the list of treasure hunters. Further research is needed to explore the unclaimed therapeutic effect of active compounds present in the shrub and the plausible molecular mechanisms of those active compounds.

REFERENCES

- Kumar S, Malhotra R, Kumar D. *Euphorbia hirta*: Its chemistry, traditional and medicinal uses, and pharmacological activities. *Pharm Rev* 2010; 4(7): 58-61.
- Prajapati ND, Purohit SS, Sharma AK, Kumar T. Handbook of medicinal plants. Jodhpur: Agarbios; 2003.
- Agarwal S S, Paridhavi M. Herbal drug technology. Hyderabad: Universities Press Private Limited; 2007. p. 625.
- Kokate CK, Purohit AP, Gokhle SB. Pharmacognosy. Delhi: Vallabh Prakashan Publishers; 2004. p. 597.
- Khare CP. Indian medicinal plants, An Illustrated Dictionary; 2007. p. 76.
- Hebbar S S, Harsha V H, Shripathi V, Hegde G R. Ethnomedicine of Dharwad District in Karnataka, India: Plant used in oral health care. *J. Ethnopharmacol* 2004; 94(2-3): 261-266.
- Nadkarni K M. Indian Materia Medica, Vol, 1, 3rd Ed, Popular Prakashan, Bombay; 1976. p. 45-52.
- Cowan MM. Plant products as antimicrobial agents. *Clin Microbiol Rev* 1999; 12: 564-82.
- Teron R, Borthakur SK. Traditional knowledge relating to use of flora and fauna as indicators in predicting annual seasons among Karbi tribe of Assam. *Indian J Tradit Knowl* 2009; 8: 518-24.
- Gupta VK, Arya V. A review on potential diuretics of Indian medicinal plants. *J Chem Pharm Res* 2011; 3: 613-20.
- Cruz-Garcia GS, Price LL. Ethnobotanical investigation of 'wild' food plants used by rice farmers in Kalasin, Northeast Thailand. *J Ethnobiol Ethnomed* 2011; 7: 33.
- Pandey M, Debnath M, Gupta S, Chikara SK. Phytomedicine: An ancient approach turning into future potential source of therapeutics. *J Pharm Phytother* 2011; 3: 27-37.
- Adnan N, Othman N. The Relationship between plants and the Malay culture. *Procedia Soc Behav Sci* 2012; 42: 231-41.
- Hussain MS, Fareed S, Ansari S, Rahman MA, Ahmad IZ, Saeed M, et al. Current approaches toward production of secondary plant metabolites. *J Pharm Bio allied Sci* 2012; 4: 10-20.
- Sharma M, Kumar A. Ethnobotanical uses of medicinal plants: A review. *Int J Life Sci Pharm Res* 2013; 3: L52-7.
- Patel D, Kaur G, Sawant MG, Deshmukh P. Herbal medicine - A natural cure to arthritis. *Indian J Nat Prod Resour* 2013; 4: 27-35.
- Lahlou M. The Success of natural products in drug discovery. *Pharm Pharm* 2013; 4: 17-31.
- Shad AA, Shah HU, Bakht J. Ethnobotanical assessment and nutritive potential of wild food plants. *J Anim Plant Sci* 2013; 23: 92-7.
- Joshi BC, Joshi RK. The role of medicinal plants in livelihood improvement in Uttarakhand. *Int J Herb Med* 2014; 1: 55-8.
- George V, Ijnu TP, Chithra MA, Pushpangadan P. Can local health traditions and tribal medicines strengthen Ayurveda? Case study 1. Janakia aryalpathra Joseph and Chandras. *J Trad Folk Pract* 2016; 4: 1-6.
- Hasan MN, Azam NK, Ahmed MN, Hirashima A. A randomized ethnomedicinal survey of snakebite treatment in southwestern parts of Bangladesh. *J Tradit Complement Med* 2016; 6: 337-42.
- Savinaya MS, Patil SS, Narayana J, Krishna V. Traditional medicine knowledge and diversity of medicinal plants in Sharavathi valley region of central western Ghats. *Int J Herb Med* 2016; 4: 124-30.
- Swamy NV, Gowda NK, Sudhakar R. Extraction and dyeing conditions of natural dye from flowers of *Plumeria rubra* L. On textiles and fastness properties. *Indian J Trad Knowl* 2016; 15: 278-84.
- Panda T, Mishra N, Pradhan BK, Rout SD, Mishra RK, Mohanty RB. Plants used in traditional healthcare of livestock: A case study from Kendrapara district, Odisha, India. *J Med Plants Stud* 2017; 5: 175-82.
- Kebebew M, Mohamed E. Indigenous knowledge on use of medicinal plants by indigenous people of Lemo district, Hadiya zone, Southern Ethiopia. *Int J Herb Med* 2017; 5: 124-35.
- Singh NP. Flora of Eastern Karnataka. Vol. I. New Delhi: Mittal Publications; 1988. p. 399-400.
- Matthew KM. An Excursion Flora of Central Tamil Nadu, India. Netherlands: A.A Balkema, Rotterdam; 1995. p. 288.
- Manjunatha BK, Krishna V, Pullaiah T. Flora of Davanagere district, Karnataka, India. New Delhi, India: Regency Publications; 2004. p. 241.
- Khare CP. Indian Medicinal Plants: An Illustrated Dictionary. New York: Springer-Verlag; 2004. p. 76.
- Katrahalli K, Kambhar S. Flora of Gadag district, Karnataka. Germany: Lap Lambert Academic Publishing; 2016. p. 159.
- Daulatabad CD, Desai VA, Hosmani KM, Jamkhandi AM. Novel fatty acids in *Azima tetracantha* seed oil. *J Am Oil Chem Soc* 1991; 68: 978-9.
- Bennett RN, Mellon FA, Rosa EA, Perkins L, Kroon PA. Profiling glucosinolates, flavonoids, alkaloids, and other secondary metabolites in tissues of *Azima tetracantha* L. (Salvadoraceae). *J Agric Food Chem* 2004; 52: 5856-62.
- Gayathri G, Nair BR, Babu V. Isolation and characterization of a triterpenoid from the leaves of *Azima tetracantha* Lam. *Int J Pharm Sci Res* 2016; 7: 2090-6.
- Kavitha C, Sandhiya V. Separation and characterization of triterpene compound Euphol from the leaves of *Azima tetracantha*. *Int J Pharm Sci Res* 2016; 7: 3423-7.
- Rani VG, Murugaiah K. GC-MS determination of bioactive compounds in *Azima tetracantha* leaves. *World J Pharm Res* 2015; 4: 2225-31.
- Begum HV, Dhanalakshmi M, Muthukumaran P. *In vivo* evaluation of anti-diarrhoeal activity of the leaves of *Azima tetracantha* Linn. *Int J Nutr Metab* 2013; 5: 140-4.
- Tilton F, Kumar NP, Priya LK. Screening of plants for anti-quorum sensing potentials against biofilm producing gram negative bacteria. *Asian J Sci Technol* 2014; 5: 375-7.
- Eerike M, Konda VG, Arunachalam R, Dawood U. Evaluation of antiepileptic activity of ethanolic extract of *Azima tetracantha* root in mice. *Int J Curr Pharm Res* 2016; 8: 76-9.
- Ekbote MT, Ramesh CK, Mahmood R, Thippeswamy BS, Verapur V. Hepatoprotective and antioxidant effect of *Azima*

- tetracantha* Lam. Leaves extracts against CCl₄- induced liver injury in rats. Indian J Nat Prod Resour 2010; 1: 493-9.
40. Sowmya A, Nagarajan V. Hepatoprotective effect of *Azima tetracantha* Lam on ferrous sulphate induced toxicity in albino rats. Res J Pharm Biol Chem Sci 2014; 5: 380-7.
 41. Prakash E, Jeyadoss T, Velavan S. *In vitro* hepatoprotective activity of *Azima tetracantha* leaf extract and silver nanoparticle in hepatocytes. Pharm Chem 2015; 7: 381-90.
 42. Hepsibha TB. Validation of ameliorative efficacy of *Azima tetracantha* leaf extracts on asthma through mast cell stabilization assay. J Chem Pharm Res 2015; 7: 907-14.
 43. Muthusamy P, Suresh JA, Balamurugan G. Antiulcer Kekuda and Raghavendra: An updated review of *Azima tetracantha* International Journal of Green Pharmacy Oct-Dec 2017; 11 (4): 229 activity of *Azima tetracantha*: A biochemical study. Res J Pharm Technol 2009; 2: 344-8.
 44. Manikandaselvi S, Ramya D, Ravikumar R, Thinagarbabu R. Evaluation of anti-nephrotoxic potential of *Azima tetracantha* Lam. and *Tribulus terrestris* Linn. Int J Pharm Pharm Sci 2012; 4: 566-8.
 45. Sridharan C, Jose MA, Radhakrishnan R, Manisenthilkumar KT. Anti-inflammatory and antiarthritic activity of *Azima tetracantha* Lam whole plant in albino Wistar rats. Indian J Pharmacol 2008; 40: S83.

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