



Review Article

A REVIEW ON PHYTOPHARMACOLOGICAL PROPERTIES OF ARAPPU

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ABSTRACT

Arappu (*Albizia amara* Roxb.) is a traditional medicinal plant used in conventional medicinal systems of India and china to treat various ailments. The dried leaves were widely used in Tamilnadu for washing hair. In Ayurveda various parts of plant were used for treating piles, diarrhoea, gonorrhoea, leprosy, leukoderma and jaundice and also it is used to cure boils, burns, eruptions, swellings, ulcer and as a remedy for dandruff. From time to time, a number of reports on the various phytochemical and pharmacological properties of *Albizia amara* and also in comparison with various *Albizia* species have been reported. This review focuses on the recent investigations on phytopharmacological properties of Arappu.

Keywords: *Albizia amara*, Phytopharmacological properties, Traditional uses.

INTRODUCTION

Herbal medicinal system dates back to several billion years to the existence of human civilization and it forms the basis for treatment of human diseases. Indian Ayurvedic medicinal system and traditional Chinese medicinal system are the most ancient yet a living tradition that uses plants as a whole extract which is basis for modern medicine.¹ Medicinal herbs have been used as several forms in various indigenous medicinal system like Siddha, Ayurveda, Unani, Western and Chinese traditional medicine system.² The Phytochemical constituents of plants were considered important as it increased the acceptability of traditional medicine.³

The genus *Albizia* mostly consist of approximately 150 species, most of them are trees and shrubs confined to tropical and subtropical region of Asia, Africa and Australia.⁴ Among those about 16 species of *Albizia* are native to Indian subcontinent and have been used as avenue trees and shade trees in tea and coffee plantation. Most notably, *Albizia julibrissin*, *Albizia lebeck*, *Albizia procera* and *Albizia amara* are the considered species used in Ayurvedic medicine⁵

Albizia amara is a potent medicinal plant which has important medicinal properties and traditional uses. The scientific documentation and compiling of the data was the need of the hour with a critical review on the importance and reported properties of the plant to bridge the traditional uses with the modern medicinal usages.

Albizia amara commonly known as Arappu (in Tamil), moderate sized, branched drought tolerant deciduous tree grows up to 10 meters tall belongs to the family fabaceae and usually found in dry forest of South India in Tamil Nadu, Andhra Pradesh and Karnataka. It is broadly distributed in Africa, from Sudan and Ethiopia southwards to Zimbabwe, Botswana and the Transvaal. It is a strong light demander, intolerant to shade, very hardy and largely grows in sandy woodlands.⁶ It has smooth,

dark green, scaly bark and branches are densely yellowish or gray pubescent. Leaves 12 cms long are pinnately compound with 15-24 pairs of small linear leaflets on 6-15 pairs of pinnane and 1.3 cm long petiole. There are glands near and middle of the petiole. The leaflets are narrow- elliptical, overlapping, 8 × 2.5 mm, appressend, pubescent or glabrescent, base- sub acute, margin sparsely ciliate and apex obtuse. Flowers are creamy white to pale yellow, fragrant, pedicelled, in 12-20 globose heads and are in clusters. They develop mostly when the tree is leafless. Fruits are oblong pods, about 10 to 28 × 2 to 5 cm, compressed, grayish brown, puberulous, thin 8-20 cm faintly veined, straight or wavy along indehiscent contains 6-8 flattened seeds 8-13 × 7-8 cm.^{5,6}

TAXONOMY

Kingdom	Plantae
Division	Angiosperms
Class	Eudicots
Order	Fabales
Family	Fabaceae
Subfamily	Mimosaceae
Genus	<i>Albizia</i>
Species	<i>amara</i>

COMMON NAMES

English	Bitter Albizia, Oil cake tree
Hindi	Lallei, Krishna siris
Tamil	Usilai, Arappu, Wunja
Malayalam	Oonjal, Varacchi, Chalavagai
Kannada	Chujjulu, Chigare, Sujjali
Telugu	NallaRenga, Narlinga

TRADITIONAL USES

The dried leaf powder commonly called as Arappu were used to wash hairs, separately and also in combination with shikakai powder as it acts as a natural conditioner, controls hair fall,

dandruff and cools the body. The seeds of this plant are used as an astringent, treating piles, diarrhoea, gonorrhoea, leprosy, leucoderma, erysipelas and abscesses. The leaves and flowers have been applied to boils, burns, eruptions, swellings and as a remedy for dandruff. The fruit pods are emetic and are used in treatment of cough and malaria. The tree yield gum which cures ulcer. The bark is used to treat jaundice and mouth inflammation.⁷ This review focuses on the plant *Albizia amara* for its reported phytopharmacological properties which substantiate the traditional uses.

PHYTOCHEMICAL PROPERTIES

Phytochemical investigation of *Albizia amara* afforded different classes of secondary metabolites such as saponins, terpenes, alkaloids and flavonoids. The petroleum ether extract of leaves had fatty acid methyl ester where the ethanolic extract reported to have triterpene saponins, a phenolic glycoside and a flavonol glycoside called 4'-O-methyl rutin.⁸ Hydrolysis of triterpene and saponins yield oleanolic acid, echinocystic acid, glucose, arabinose and rhamnose. From the benzene extract, β -sitosterol was isolated.⁸ From the ethylacetate and acetone extracts different compounds like melanoxetin, 3'-O-methyl -melanoxetin, melacacidin, 3'-O-methyl -melacacidin tetra methyl ether, 4'-O-methyl -melacacidin tri methyl ether were isolated and characterized as potential phenolics.^{8,5}

Extracts prepared from seeds were reported to have spermine macrocyclic alkaloids - Budmunchiamines A-C based on their

interaction with DNA.⁹ The chromatographic finger print analysis of methanolic leaf extract by HPTLC technique revealed the presence of macrocyclic alkaloids Budmunchiamines L4 and L5 which was characterized and confirmed by FTIR, ¹H NMR, MASS and CHN analysis.⁷

From the methanolic extract of *A. amara* leaves, six flavonoids were isolated using chromatographic techniques, which includes quercetin 3-O-gentiobioside, myricetin 3-O- α -rhamnopyranoside (myricitrin), quercetin 3-O- α -rhamnopyranoside, myricetin, quercetin and kaempferol. Their structure elucidation done by chemical investigation (enzymatic and complete acid hydrolysis) and physical investigation (UV, NMR and MS).¹⁰

Extract prepared from seeds of *Albizia amara* contain Oxirane, trimethyl cyclic ether, Heptanoic acid, Octanoic acid, Ethyl ester, 1,1 Bicyclo propyl cycloalkene, 1,1 Dimethyl cycloalkene, Dichloro acetic acid, 2,2 Dimethyl propyl esters, 7 Oxabicyclo heptan-2-one, Tetradecane, 1-iodo alkane, Decane, 2,5,9 - Trimethyl alkane, 4 Pentadecyne, 15- Chloroalkyne and Diazoprogerone. Extract prepared from leaves of *Albizia amara* reported to have 1,10 Decanedion, 3-O-Methyl-d-Glucose, 1 tetradecyne, Octanoic acid, Phytol, 1-Hexene, 3,5,5-Trimethyl alkene, 2 bromononane, 1-iodo-2-methylnonane, 1-iodo-2-methylundecane, Eiconase, Squalene, Undecane, 2,8 - Dimethyl Alkane, 1-Methylene Octadecanoic acid and 2-Oxomethyl ester.¹¹

Table 1: Phytochemical profile of various parts of *Albizia amara* extracts

Constituents	Leaves						Seeds				Bark
	Me	Et	Pe	Ea	Ac	Hx	Hx	Ac	Ea	Me	Ee
Alkaloids	+	+	-	+	-	+	+	+	+	-	-
Flavonoids	+	+	-	+	+	+	+	+	+	+	-
Phenolics	+	-	-	+	+	+	+	+	+	+	+
Tannins	+	-	-	-	-	-	-	-	-	-	+
Saponins	+	+	-	+	+	-	-	-	-	+	+
Carbohydrates	+	+	-	+	-	+	+	+	+	+	-
Glycosides	+	+	-	+	+	+	+	-	-	-	+
Steroids	-	-	+	+	-	+	+	+	+	-	-
Terpenoids	+	+	-	-	-	-	-	-	-	-	-
Proteins	-	-	-	-	-	+	+	+	+	-	-

Me - Methanol, Et - Ethanol, Pe- Petroleum ether, Ea-Ethyl acetate, Ac-Acetone, Hx-Hexane

PHARMACOLOGICAL PROPERTY

Antibacterial activity

Baltazary et al., (2010) reported, the methanolic leaf extract has broadest antimicrobial spectrum and among the tested microbes, the most susceptible bacteria were the Gram negative bacteria *E.coli* and *Salmonella typhi* while *K.pneumoniae* was the least susceptible bacterium.¹² Praveen et al., (2011) experimented the anti bacterial activity of *Albizia amara* leaves with six different solvents and has reported that the chloroform extract recorded highest anti bacterial activity followed by methanol, ethanol and hydro-methanolic extracts, and no significant activity observed in petroleum ether extract.¹³ Karuppanan Kokila et al., (2014) tested antibacterial activity of seeds and leaves extract of *Albizia amara* using four different solvents and reported that the acetone and methanolic extracts of leaves and seeds showed significant antibacterial activity.¹¹ Deepika et al., (2015) reported antibacterial property against *Salmonella typhi*, *Klebsiella aerogene*, *Enterococcus faecalis*, *Coryne bacterium*.¹⁴ Arvind et al., (2016) isolated Trypsin inhibitor from *Albizia amara*

showed antibacterial activity against *P. aeruginosa* and *B.subtilis*.¹⁵ Balasubramani et al., (2017) reported antibacterial activity against Gram negative bacteria, *Staphylococcus aureus* which was found to be more sensitive to bio reduced chloroauric acid into well dispersed gold nano particles using *Albizia amara* Roxb plant extract than the leaf aqueous extract.¹⁷ Abdel karim et al., (2016) reported antibacterial activity of flavanone isolated from ethanolic leaves extract of *Albizia amara* against four bacterial strains.¹⁶

Antifungal activity

Baltazart et al., (2010) reported antifungal activity of methanolic leaf extract of *Albizia amara* against two fungi *Candida albicans* and *Cryptococcus neoformans*.¹² Praveen et al., (2011) reported that the chloroform leaf extract showed a higher antifungal activity against 21 microbes of which *Fusarium lateratum* was the most susceptible fungus.¹³ Thippeswamy et al., (2013) reported that the *Aspergillus flavus* and its aflatoxin B1 production was completely inhibited in vitro by

Budmunchiamines (BUA) at 1 mg/ml concentration.¹³ Thippeswamy et al., (2014) reported the inhibitory effect of BUA on growth and fumonisin B1 production of *Fusarium verticillioides*, a phytopathogenic fungus. So, it was emphasized that BUA can be used as antifungal agent against post harvest fungal infestation of food commodities and mycotoxin contamination.¹⁷ Thippeswamy et al., (2015), reported that BUA showed activity against *C. albicans* and *C. neoformans*.¹⁸ Deepika et al., (2015) reported antifungal activity against *Candida albicans* and *Aspergillus niger*.¹⁶ Arvind et al., (2016) isolated Trypsin inhibitor from *Albizia amara* showed antifungal activity against *C.albicans*, *A.alternata* and *A.tenuissima*.¹⁵ Abdel karim et al., (2016) reported antifungal activity of flavanone isolated from ethanolic leaves extract of *Albizia amara* against two fungal strains.¹⁶

Antioxidant property

Deepika et al., (2015) has reported the antioxidant activity of *Albizia amara* bark extracts through DPPH-radical scavenging assay and reducing power activities and has shown the striking evidence for the application of *Albizia amara* bark extracts as safe antioxidant agents.¹⁹ Sowndhararajan Kandhasamy et al., (2012) investigated the antioxidant activity of bark extract of *Albizia amara* and has revealed the higher free radical scavenging activity in the ethyl acetate fraction.¹⁴ Karupppannan Kokila et al., (2014) has reported the antioxidant activity of *Albizia amara* leaves and seeds, extracted using different solvents methanol, acetone, hexane and ethyl acetate.¹¹ Balasubramani et al., (2017) has observed the antioxidant activity of aqueous leaf extract and the gold nano particles of *Albizia amara* leaves and has reported the *A.amara* mediated gold nano particles have more scavenging activity than the aqueous leaf extract of *A.amara*.²⁰ Thippeswamy et al., (2015) reported the antioxidant activity of the alkaloid, budmunchiamines(BUA) isolated from the leaf extract of *A.amara*.¹⁸ Raj Kumar et al., (2012) has reported the anti oxidant activity of methanolic extract and petroleum ether extract of *Albizia amara* leaves. IC 50 value was found to be 205 µg/ml for methanolic extract and 148 µg/ml for petroleum ether extract.²¹

Anticancer activity

Gopinath et al., (2013) has reported the cytotoxic activity of *Albizia amara* plant extracts by MTT assay, and has revealed among the three solvent extracts, the ethyl acetate extract showed effective cytotoxic action with median inhibitory concentration (IC50) of 36.31µg/ml followed by ethanol extract with 57.54 µg/ml and aqueous extract with 83.18µg/ml. The *Albizia amara* treatment inhibited cell growth and proliferation of human breast cancer cells and induced apoptosis.²² Mar et al., (1991) reported the high cytotoxic potential of Budmunciamines towards cultured mammalian cell lines like Human Breast Cancer, Colon Cancer, Lung Cancer and melanoma cell lines.¹⁹ Balasubramani et al., (2016) has reported the anticancer activity of *Albizia amara* mediated gold nano particles and has provided the IC₅₀ inhibitory values for HeLa and Vero cells as 47.77 µg ml⁻¹ and 72.28µg ml⁻¹ respectively.²⁰

Hepatoprotective property

Sastry et al., (1966) reported that the ethanolic extracts of the bark of *Albizia amara* is known to have triterpene saponins, tannins and glycosides. Umbare et al., (2009) reported the saponins lowers the serum cholesterol level by having the resin like activity which induces the conversion of cholesterol to bile

acids and hence reducing the entero hepatic circulation of bile acids.²³

Antihyperlipidemic property

Gulnaz et al., (2013) has studied the hypolipidemic activity of *Albizia amara*. The effects of ethanolic extract of *Albizia amara* were observed on rats induced with hyperlipidemia by high fat diet showed significant decrease in low density lipoproteins(LDL) and increase in high density lipoproteins(HDL).²⁴ Rohit et al., (2014) reported anti hyperlipidemic activity of *Albizia amara* bark against hyperlipidemia induced by Triton X-100. The result inferred from Triton X-100 induced rats treated with ethanolic extract of *Albizia amara* showed a significant decrease in serum parameters such as total cholesterol (TC), Triglycerides (TG), Low density Lipoproteins (LDL), very low density Lipoproteins (VLDL) and increase in high density lipoproteins (HDL). From the acute toxicity studies ethanolic extract of *Albizia amara* considered as safe and non toxic for pharmacological screening.²⁵

Anti inflammatory property

Khan et al., (2011) performed the experiment for dose determination and evaluation of Anti-inflammatory and Analgesic activity of the Ethanolic extracts of *Albizia amara*. From dose determination studies following OECD guidelines, the safe dose was determined as 2000 mg/kg. The female Wister albino rats were treated with ethanolic extracts of *Albizia amara* were checked for anti-inflammatory property using carrageenan induced paw edema. The percentage reduction in paw volume was found to be 15%. Thus, the extract showed significant anti-inflammatory activity as compared with standard drug Aspirin.²⁶

Larvicidal activity

Murugan et al., (2007) reported the larvicidal activity and repellent potential of *Albizia amara* against a dengue vector *Aedes aegypti*, the yellow fever mosquito. The larvicidal concentration for different instar larvae and pupae of *Aedes aegypti* were observed to possess a significant activity against its survival and it also inferred to have a effective smoke toxicity level.²⁷ Vinayagam et al., (2008) experimented the larvicidal activity of ten medicinal plants against malarial vector *Anopheles stephensi*. The percentage mortality of III instar larvae after the treatment of plant extracts were studied, *Albizia amara* was found to have 100% mortality. The pupation and adult emergence was appeared to be dose dependent.²⁸

Antiarthritic property

The alkaloid extracts of *Albizia amara* was also found to exhibit antiarthritic activity tested using Freund's adjuvant induced arthritis in albino rats. They observed increase in superoxide dismutase and catalase, and decrease in lipid peroxidation in arthritic rat treated with methanolic extract *Albizia amara* indicating the extract have free radical scavenging activity.^{29,30}

CONCLUSION

Arappu is a common traditional plant which is in regular practice as a body coolant and conditioner. There is a lack of evidence based data detailing the phytopharmacological reports on the above said traditional use. Though there are number of pharmacological properties reported which substantiates some of the traditional uses which were not documented. Hence future

studies may be carried out to prove the potential of the plant as a conditioner and body coolant as there were more commercial samples marketed in its partner product from shikakai. Attempts are being made to extend the work up to clinical trial stages as most of the information available on the pharmacological activities is purely academically oriented. Identification of a valid compound will provide a natural effective and economically viable product to cosmetic industry.

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