International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR |Volume 6 | Issue 1 | Jan - Mar - 2018
www.ijamscr.com

Research article *Medical research*

A comprehensive Review on Ethanobotanical and Pharmacological uses of *Artocarpus hirsutus* Lam

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ABSTRACT

The association of humans and animals with plants originated with the beginning of the life on the earth when plants supplied much of the shelter, oxygen, food and medicine for higher life. The use of herbs and its extracts for their healing powers have been traced early and writings used to code those plants that can ease disease. India being the treasure house of biodiversity with its diverse ecological conditions rich ethnic diversity and strong traditional knowledge base accounts for 45,000 plant species out of which is used in herbal formulation. The Artocarpus (Moraceae) comprises about 50 species of evergreen and deciduous trees. The genus is economically importance as a source of edible fruit, timber and folk medicines. The aim of the present review is to cover the comprehensive information of the plant *Artocarpus hirsutus*. The extensive biological evaluation on the components of this species rarely appears in literature which restricts its use as medicinal herb. The fruits and seeds of the plant were edible and many parts of the plants were used in folk medicine meant for external use.

Keywords: *Artocarpus hirsutus,* Folk medicine, Moraceae.

INTRODUCTION

The plants may be regarded as a biosynthetic laboratory not only for the chemical compounds like carbohydrates, proteins and lipids that are consumed as food by humans, but also for a multiple compounds like glycosides, alkaloids, volatile oils, tannins, etc. That exert different physiological effects on human body. Those compounds that are responsible for therapeutic effects are usually the secondary metabolites that are mentioned above. Systemic studies of crude drugs are embraced through the consideration of both primary and secondary metabolites derived from plant as a result of plant metabolism. Since the beginning of civilization by humans the medicinal plants have been used by humans for its therapeutic value. Nature is a source of medicinal agents for many years and an impressive number of modern drugs have been isolated from plant source. Numerous isolations are based on the uses of therapeutic agents used in traditional medicine. Consumption of medicines derived from plants is wide spread and increase significantly in both traditional and modern methods of medicine. According to World Health Organization more than 80% of population in developing countries depend primarily on plant based medicines for their basic healthcare needs [1]. Plants are potential biochemical factories and have been the components or constituents in phytomedicines. Investigation on medicinal values of *Artocarpus*

hirsutus added a great deal in phytochemistry with regard to availability of more complex phytochemical constituents, antibacterial, anthelmintic, anti inflammatory and antiviral activity [2]. A wide range of Artocarpus species are used for food and traditional folk medicines in South-East Asia, Indonesia, India and Western part of Java. The artocarpusn tree is almost as strong as teak and has an advantage of lightness. In west Coast it is used as a substituent for teak for all purposes for which teak is employed for boat and shipbuilding, construction works, furniture and agricultural implements. Seeds of *Artocarpus hirsutus* are roasted, eaten which contains 16 -17% oil used locally in medicines. Artocarpus species offers advantages of profitable multipurpose plant for production of fruits and timber [3, 4]. The GC-MS analysis of the methanolic extract of *Artocarpus hirsutus* shows the presence of 18 bioactive components with valuable biological activities [5]. The major chemical constituents reported are Butanal, 2-Methylbutyraldehyde, 2-Methyl-3-propyloxirane, 5-Hydroxymethylfurfural 3, 3-Dimethylbutan-2-yl methylphosphonofluoridate, 2-Furancarboxaldehyde 5-methyl- Propylphosphonic dichloride, N-Pentadecane 2, 6-dimethoxy-4-vinyl phenol, Quinic acid 5,6-Dimethoxy-2-methyl-1-indanone and n- Hexadecanoic acid. The presence of various biologically active compounds in *A. hirsutus* proved its pharmaceutical importance. The plant investigation on *A. hirsuts* has opened up a new perspective role in the field of pharmaceutical research and they can be used for the development of potent, novel agents for the treatment of several diseases [6].

BOTANICAL DESCRIPTION

Artocarpus hirsutus is a perennial tree belonging to genus Artocarpus. It is a tall evergreen tree found in Western Ghats of India. [7] The word Artocarpus means evergreen tree which are grown in the tropical and hirsutus means prickly and hairy which resembles the morphological feature of the fruit of the plant. It grows well at an altitude of 1000 m ranging from sea level with a minimum annual rainfall of 1500mm and above. Its wood is used as timber for making wooden furniture and boat. The bark, seeds, leaf and fruits are of medicinal importance. Traditionally tribal peoples are using this plant to treat many diseases like ulcers, wounds, joint pains etc.

HABITAT AND SYNONYMS

Taxonomy and Ethnobotany

Artocarpus hirsutus Lam. belongs to angiosperms and the details [8, 9] are:

- Kingdom: Plantae
- Division: Angiosperms (unranked)
- Phylum: Eudicots (unranked)
- Class: Rosids (unranked)
- Order: Rosales
- Family: Moraceae
- Tribe: Artocarpeae
- Genus: *Artocarpus*
- Species: *hirsutus*
- Species authority:Lam

Vernacular names of *Artocarpus Hirsutus* Lam [10] are

- English: wild Jack
- Malayalam: Annali, Annili, Aini, Ayari , Ayani, Ayaniplavu,
- Kannada: Hebbalasu.
- Telugu: Pejuta
- Marathi: Pat-phanas, Ranphanas
- Tamil: Kattuppala, Akkini, Anjili

It is a large evergreen tree up to 70 m in height with a straight clear bole and dense foliage found up to an altitude 1200m in evergreen forest of peninsular India.

Bark

The bark is grey colour, smooth when young and later becomes scaly and lenticellate. The branches of the tree are strigose with tawny hair and annular scars. The exudates called as latex will be milky white, sticky and profuse.

Leaves

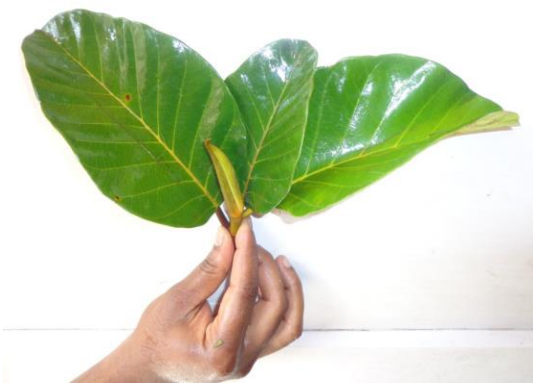
Leaves are simple, alternate, spiral, clustered at twigs end, broadly egg shaped or elliptic. Stipules 2.5 cm long, lanceolate, with scattered hairs above and dense hair below leaving annular scar. Petiole is nearly 3 cm long, stout, subterete or planoconvex. Lamina is 10-30.5 x 5-14 cm ovate to broadly elliptic. Apex is sub acute, base rounded or sub acute.

Flowers

Separate male and female flowers with numerous, minute, greenish yellow and can be separately seen in different heads of same plant in the leaf axils. Male heads are cylindrical, about 15 x 1cm, pendulous with age of about 3 cm long hairy peduncles. Female heads are ovoid about 3 x 1.5 cm.

Fruits

Fruit is a syncarpous about 5 cm long and 4 cm in diameter. Short cylindrical elliposoid, yellow to orange when ripe. It is covered with numerous spines like projections. Seeds are ovoid, white, 1.3-2cm long [11, 12].



Cultivation and Propagation

It needs a warm humid climate, heavy rainfall and it thrives well in all type of soil. It is found commonly in Western Ghats from north Karnataka to Malabar Coast extending up to Travancore. Trees are propagated through seeds or by grafting. Flowering season is from December to January and the fruits start too ripe in the month of May and June. The seeds can be viable up to 10 months and the seed germination is poor as it takes more than 40 days to germinate.

Phytochemical Studies

The phytochemical screening of various extracts of the plant such as ethanol, methanol, hydroalcoholic and Petroleum ether shows the presence of secondary metabolites such as tannins, carbohydrates, glycosides, alkaloids, flavonoids, triterpenoid, sterols, saponins, phenolic compounds, gum and mucilage [13, 14].

TRADITIONAL USE

Bark

Ash of the plant bark mixed with coconut oil is used against 'dhobi's itch' and ringworm externally. Bark paste mixed in coconut oil can also applied for snake bite.

Leaves

Used to treat joint pain and rigidity. Leaves Crushed with turmeric can treat chronic hemorrhage (A folk medicine in northern Kerala)

Seeds

Roasted with crushed onion fried in yogurt and inserted rectally to treat constipation. It is also used as laxative.

Seed oil

Appetite stimulant.

Wood

Used as a substitute for making 'oil massage cot' popularly known as ennathoni (wooden vessel for Ayurvedic oil massage) for the 'panchakrma' treatment. (Ayurvedic system practiced in Kerala). The bark infusion is applied to cure small pimples and cracks of the skin. Powered bark is used to heal sores. Dry leaves are used to treat burbose and hydrocele.

MEDICINAL USES

Wild jack in Ayurvedic medicine pacifies vitiated *vata* (the air quality present within the human body) and *pitta* (bile present within the body), anorexia, burning sensation of extremities and sexual weakness. Unriped fruit cause vitiation of *tridosha* (three types of substances that are important in balancing the human body and health according to ayurveda) [(15)].

PHARMACOLOGICAL IMPORTANCE

Antioxidant Activity

The methanolic extract of *A.hirsutus* fruits were analysed for invitro antioxidant assays like DPPH free radical scavenging, reducing power and compared with standard antioxidant compounds such as ascorbic acid and butylated hydroxy

anisole. On comparing the results, scavenging effect the methanolic extracts shows a little effect in DPPH assay but a comparative better effect on reducing power [16, 17].

Hepatoprotective Activity

Invivo hepatoprotective activity of the plant was done with CCl_4 as an inducing agent for hepatic damage. The protective action against the hepatic damage was determined by measuring the levels of biochemical markers like aspartate amino transferase (AST), alkaline phosphatase (ALP), alanine aminotransferases (ALT), total bilirubin and total cholesterol. The marker biochemical levels such asAST, ALT, ALP, total bilirubin and totalcholesterol were significantly raised in CCl_4 induced rats when compared to standard drug and the histopathological study was also done using the liver tissues. The result shows a significant hepatoprotective activity which might be due to the presence of flavonoids and tannins [18].

Antiulcer Activity

The antiulcer activity was conducted with ethanolic extract of the plant bark using rat. The effect of the extract and the standard on gastric acid secretion volume, pH, total acidity and gastric ulcer were noted and compared [19].

Antimicrobial Activity

Methanolic and petroleum ether extract of *Artocarpus hirsutus* shows a good inhibition against various bacterial strains when compared to the standard. The methanolic extract shows a maximum zone of inhibition against S.aureus and K.pneumonia (17mm) and the petroleum ether extract shows the maximum inhibition zone against S.aureus (15mm) [20].

Antidiabetic Activity

The ethyl acetate extract of *A. hirsutus* seeds at different doses was selected and administered orally. Blood glucose levels of the animals were estimated by the glucose oxidase method and the insulin levels were measured by chemiluminescence assay. Antihyperglycemic activity of the test substance in diabetic rats shows a significant reduction in blood glucose levels ($p<0.001$) at the time intervals of 2, 4, 6, and 8 hrs respectively, as compared to control groups. The antioxidant enzymes superoxide dismutase and catalase levels were significantly raised, whereas malondialdehyde thiobarbituric acid residue substances levels have been decreased ($p<0.001$). The results suggested that the ethyl acetate extract of *A. hirsutus* seeds extract shows a potential antidiabetic and antioxidant effect justifying the usage of the plant for treating diabetes mellitus and the related oxidative damage [21].

Diuretic Activity

The aqueous extract of *Artocarpus hirsutus* fruits were evaluated for diuretic activity using modified Lipchitz method. The parameters like urine volume, concentration of excreted sodium and potassium ions, ratio of sodium to potassium ions excreted were noted. Significant diuretic activity was found to present in the *Artocarpus hirsutus* fruit extract [22].

CONCLUSION

Artocarpus hirsutus (wild jack fruit) is a well known plant as a source of traditional Medicine, food and wood industry. Plants are very important for the existence as well as remedies of human diseases because they contain the phytoconstituents of therapeutic value. The increase in toxicity, allergic manifestations and unaffordable cost of the synthetic drugs the use of medicinal plants is growing worldwide. There has been tremendous interest regarding bioactive compounds that have been produced from this plant species. It needs several researches to make the plant into a medicinally potent and useful for the public as a safe medicine in formulation.

Conflict of interests

Declared none

Authors contributions

All the author have contributed equally

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How to cite this article: R.Rajeswari, G.Sumithira, V.Ganesan. A comprehensive Review on Ethanobotanical and Pharmacological uses of Artocarpus hirsutus Lam. Int J of Allied Med Sci and Clin Res 2018; 6(1): 197-202.

Source of Support: Nil. **Conflict of Interest:** None declared.