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ARTOCARPUS HETEROPHYLLUS LAM: FROM TRADITIONAL REMEDY TO MODERN PHARMACOLOGY – A COMPREHENSIVE REVIEW

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ABSTRACT
The history of every civilisation has recorded the use of medicinal plants to treat illnesses due to their safe and efficient active ingredients. *Artocarpus heterophyllus* Lam (Moraceae family). Traditional Ayurvedic and Unani systems used this plant to treat asthma, skin diseases, diarrhoea, and diabetes. Many phytochemicals like flavonoids, tannins, and artocarpin, are responsible for the diverse pharmacological actions shown by the plant. Modern research validates its therapeutic potential through its anti-diabetic, anti-cancer, anti-viral, and antioxidant activities. The plant also demonstrates anti-inflammatory, hepatoprotective, and anti-platelet properties, alongside anti-bacterial, anti-malarial, and diuretic effects. Furthermore, studies highlight its wound healing, immuno-modulatory, anti-fungal, and anthelmintic potential, as well as its ability to inhibit melanin synthesis and provide sedative effects. This review compiles these findings, indicating the jackfruit as a valuable resource for developing therapeutic agents for many ailments.

KEYWORDS: *Artocarpus heterophyllus* Lam., Atibruhatphala, Prenylated Flavonoids, Jacalin, Artocarpanone.

INTRODUCTION

The World Health Organization approximates that over 80% of people in developing countries use plant-based medicines for primary healthcare, which shows a significant increase in the use of plant-based medicines worldwide.[1]

Artocarpus heterophyllus Lam. is a Moraceae (mulberry) family plant. It is also known as the Ceylon jack tree or jackfruit. [2] The plant is an evergreen tree native to the Western Ghats forests of southern India. It is widely distributed in tropical and subtropical parts of Asia, including Thailand, Sri Lanka, India, and Pakistan.[3] The distribution of jackfruit is affected by environmental factors, and it is more commonly found in areas with high rainfall. It is less commonly found in areas with low rainfall.[4] The name "jackfruit" comes from the Portuguese word Jaca, which is derived from the Malayalam word Chakka.[5] Jackfruit is known as Atibruhatphala and Kantaphala in ancient Sanskrit, which describes its large size and spiky skin. It is the national fruit of Bangladesh and the third most widely produced fruit in South India after mangoes and bananas.[3] Jackfruit is known as "poor man's food" because of its low price and availability in summer when other food products are scarce.[6]

The jack fruit have an exterior with cone-shaped structures and an interior that is fragrant and juicy.[3]

Apart from its use as a source of food, the dense canopy of the jackfruit tree can be used as a decorative screen in home gardens while the pulp and seeds are vital for human nutrition, the leaves and fruit waste serve as animal fodder and the heartwood is prized as durable, termite-proof timber.[7]

The *Artocarpus heterophyllus* is a significant reservoir of bioactive secondary metabolites, including flavonoids, stilbenoids, arylbenzofurans, and tannins.[8]

Regarding traditional and folk medicinal practices, various parts of the jackfruit tree, including its bark, roots, fruits, seeds, and leaves, have been used for

centuries in Ayurvedic and Unani medicine to treat conditions such as asthma, skin diseases, diarrhoea, diabetes, and malarial fever, and are also used for wound healing, anemia, and dermatitis. The wood of the jackfruit tree has been found to have anti-inflammatory, antioxidant, and anti-aging properties, which help protect the skin.[8,9] The wood is boiled to create an orange-red dye, which is used for Buddhist priests' robes because the dye is believed to offer protection against various dermatological disorders.[5]

This review aims to provide a comprehensive evaluation of the phytochemical landscape, and pharmacological mechanisms of *Artocarpus heterophyllus*, bridging the gap between ancient folk remedies and modern therapeutic applications.

PLANT DESCRIPTION

Table 1: Taxonomical classification of *Artocarpus heterophyllus*.[10]

Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Magnoliophyta angiosperms
Class	Magnoliopsida dicotyledons
Subclass	Hamamelidae
Order	Urticales
Family	Moraceae
Genus	Artocarpus
Species	*Artocarpus heterophyllus* Lam.

Synonyms[11]

Artocarpus integrifolia L.f., *Artocarpus integer* (Thunb.) Merr., *Artocarpus brasiliensis* Gomez, *Artocarpus maximus* Blanco, *Artocarpus philippensis* Lam., *Artocarpus tuberculatus* Roxb.

Table 2: Vernacular names of *Artocarpus heterophyllus*.[12]

Sanskrit	Panasa,Atibruhatphala or Kantaphal
Hindi	Kathal or Panas
Kannada	Halasu
Bengali	Kanthal
Guajarati, Marathi	Phanas

Geographical distribution[13]

Artocarpus heterophyllus is indigenous to the rain forests of the Western Ghats in southern India. In recent years, however, these trees have been introduced to other parts of India and to tropical countries around the world.

Today, the jackfruit tree is found in the following tropical countries: Bangladesh, Malaysia, Burma, Sri Lanka, Indonesia, Philippines, Caribbean islands, evergreen forest zone of West Africa, northern Australia, parts of the United States (notably Florida and California), Brazil, Puerto Rico, Pacific Islands (including Palau, Yap, Pohnpei, Nauru, and Tabiteuea in Kiribati), Samoa, and other islands.

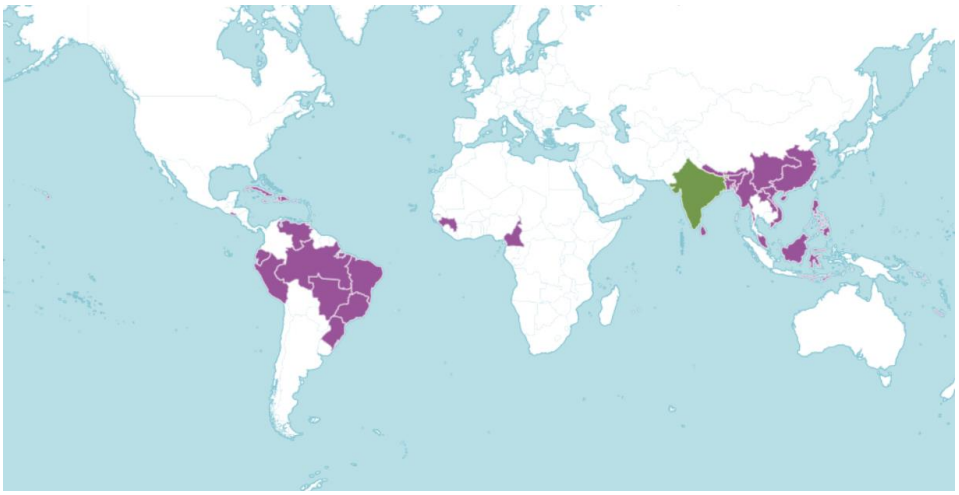

Figure 1: Global distribution of *Artocarpus heterophyllus* Lam, Green: Native range, Purple: Introduced and neutralized regions. Source: POWO/Kew Science.

MORPHOLOGY OF JACKFRUIT[14,15]

Size and Shape

The *Artocarpus heterophyllus* is an evergreen tree with a short trunk and a dense canopy. The tree grows to a height of 10 to 20 meters with trunk diameters measuring 30 to 80 centimeters. The juvenile form of the tree is conical to pyramidal, gradually becoming rounded to spreading, culminating in a dome-shaped crown. The tree has buttress roots.

The trunk and branches are reddish-brown and smooth. There is exudation of sticky, milky white latex from all parts when damaged.

Flowers

The plant is monoecious, having both male and female flowers on the same plant. The flowers are small and pale green when young, ripening to reddish. The male and female flowers are borne on separate inflorescences that originate from both the branches and the trunk. The male flowers are dense, fleshy, and cylindrical,

measuring up to 10 cm long, usually placed above the female flowers on the young branches. The female flowers are relatively larger, with an elliptical to rounded shape and a tubular calyx. Flowering takes place from December to February or March.

Fruit

The fruit is ellipsoidal to round, a type of multiple fruit formed by the fusion of the ovaries of several flowers. It grows on a long and stout stem that originates from the trunk. A mature *Artocarpus heterophyllus* tree can produce 10 to 200 fruits. The fruit is made up of three parts: the inner fleshy edible part, which is usually referred to as the bulb; the central part, which forms the skin of the syncarp; and the outer hard non-edible part, which is usually referred to as the spikes, and are green to yellowish brown in color. The large fruit parts are 30-100 cm long and 15-50 cm in diameter, weighing 10-25 or more.

Leaves

The leaves are dark green, alternate, spirally arranged, simple, entire, glossy, leathery, and rigid. They are large, measuring up to 16 cm in length, and are elliptic to oval in shape. The leaves are sticky and thick. In mature trees, the leaves are rounded and dark green with a smooth edge.

Seeds

The seeds are light brown, rounded, measuring 2-3 cm in length and 1-1.5 cm in diameter, and are enclosed in a thin white membrane. Each fruit contains 100-500 seeds. The seed coat is made up of a thin, waxy, parchment-like, and easily removable testa and a brown, membranous tegmen. The cotyledons are usually unequal in size, and the endosperm is poorly developed.

Figure 2: *Artocarpus heterophyllus* Lam tree and its various parts – leaves, Flowers, bark, fruit and seeds.

PHYTOCHEMICAL CONSTITUENTS.[15,16]

Artocarpus heterophyllus contains diverse phytochemical classes across its parts, including flavonoids, tannins, phenolic acids, steroids, alkaloids, and saponins found in the leaves, bark, and seeds. These constituents, alongside prenylated flavonoids in the roots and heartwood, are identified through qualitative screening and quantitative evaluations.

Table 3: Phytochemical constituents of *Artocarpus heterophyllus.*

Part of Plant	Phytochemical Constituents
Leaves	Flavonoids (licoflavone C, artocarpin, artocarpesin, luteolin), phenolic acids (caffeic acid, chlorogenic acid, 3,5-dicaffeoylquinic acid), chromones, terpenoids/steroids (sitosterol, cycloaltilisin 7), alkaloids, and tannins.[15,16]
Bark / Stem Bark	Phenolic compounds (3,4,5-trimethoxy-phenol), flavonoids (cycloheterophyllin, artocarpesin), betullic acid, tannins, saponins, glycosides, and fatty acids (ethyl oleate, n-hexadecanoic acid).[15,16]
Roots	Prenylated flavonoids (artonin K, albanin A, artoindonesianin P, artonin J, artocarpesin,

	norartocarpin), steroids (β-sitosterol), ursolic acid, betulinic acid, and cycloartenone.[15]
Heartwood	Prenylflavones (artocarpin, norartocarpin, cudraflavone B/C, brosimone I, kuwanon C, 6-prenylapigenin), morin, dihydromorin, and stilbenes (oxyresveratrol).[3,15]
Fruit (Pulp/Bulbs)	Carotenoids (all-trans-lutein, all-trans-β-carotene, 9-cis-violaxanthin), flavonoids (artocarpesin, norartocarpetin), steroids (artoheterophoid), and odorant compounds (ethyl butanoate, butyl acetate).[15]
Fruit (Peel / Rind)	Polyphenols (procyanidin B, dihydromyricetin), organic acids (quinic, malic, citric), and glycosides (digitoxosylhexoside).[15]
Seeds	Lectins (Jacalin, Artocarpin, Jackin), phenols, flavonoids, tannins, saponins, steroids, proteins, and minerals (potassium, sodium, magnesium, iron).[3,15]
Latex	Proteins (AMP48), phenols, tannins, glycosides, and artostenone (convertible to artosterone).[3]
Flowers	Carotenoids, flavonoids, and minerals (potassium, calcium, phosphorus).[15,16]

USE IN TRADITIONAL MEDICINE.

Artocarpus heterophyllus is a major source of a large number of nutritionally valuable compounds with significant therapeutic values. The young fruits of the plant are acrid, carminative, and astringent in nature, whereas the mature fruits are sweet in taste and used as an aphrodisiac and brain tonic. The leaf parts are effective in inflammatory disorders, carbuncles, fever, and dermatological disorders, and the ash of the leaves is used in the treatment of ulcers.

The seeds are used in treating diuretic-related problems and constipation.[17] The latex of the plant has been found to be beneficial in treating eye disorders such as defective vision and other related ophthalmic problems.

The latex is also used in treating pharyngitis and bacterial infections. A mixture of latex and vinegar has been found to aid in the healing of boils, snake bites, and glandular inflammation. The wood of the plant is relaxing, antidiabetic, and nervine in nature and is very useful in managing seizures. The root of the plant has been found to possess medicinal properties in treating dermatological disorders and asthma. The root extracts are used in the treatment of fever and diarrhea. The bark of the plant is used in the preparation of bandages, whereas the warm leaves are used in the treatment of wounds. The wood is also soothing in nature, and its pith is claimed to be abortifacient.[18]

PHARMACOLOGICAL ACTIVITIES

1. Anti-diabetic activity

Artocarpus heterophyllus has been found to possess significant antidiabetic properties by regulating glucose metabolism and protecting pancreatic β-cells from oxidative damage. The protective action can be attributed to the presence of bioactive compounds that increase insulin sensitivity. In the current study, the use of both ethanolic stem bark extracts and aqueous fruit extracts was employed to determine their effectiveness. The models employed in the study included male Wistar rats with Streptozotocin (45 mg/kg) and Alloxan (150 mg/kg) induced diabetes, in addition to hemoglobin glycation inhibition assays. The results showed that the stem bark extracts were effective in lowering blood glucose, stimulating insulin secretion, increasing glycogen deposition in the liver, and improving β-cell function.[19] The ethanolic bark extracts showed significant inhibition of the enzymes α-amylase and α-glucosidase,[20] while the fruit extract exhibited antiglycation properties with an IC50 of 56.43%.[21] The treatments also alleviated diabetic complications such as loss of weight, anemia, and hyperlipidemia.[22] In conclusion, *Artocarpus heterophyllus* is an important natural resource for the treatment of diabetes because of its ability to increase glucose uptake.

2. Anti-cancer activity

The evaluation of botanical chemopreventive compounds has emphasized the prominent anticancer activities of *Artocarpus heterophyllus* wood and seeds. Using methanolic, ethanolic, and chloroform extracts, as well as the purified flavone artocarpin, the results showed strong cytotoxic effects against breast (T47D), colon (HT29 and HCT116), and lung (A549) cancer cell lines..

Further studies have shown that artocarpin induces apoptosis through the extrinsic pathway and suppresses cytochrome P450 2C enzymes. In vivo studies showed a 46.2% decrease in tumor multiplicity and a reduction in the expression of pro-inflammatory mediators IL-6 and PCNA. Notably, the extracts displayed a favourable safety profile, which was non-toxic to normal L929 and HEK293 cell lines. Thus, the various bioactive compounds of *Artocarpus heterophyllus* have been identified as promising leads for the development of safe and targeted natural oncologic therapies.[23-25]

3. Anti-viral activity

Studies on botanical antiviral agents have shown that the leaves of *Artocarpus heterophyllus* have potent inhibitory effects against Hepatitis C Virus (HCV).

Using an in vitro model of Huh7it-1 cells infected with genotype 2a (JFH1) of HCV, the dichloromethane (DCM) extract provided a potent lead compound with an IC50 value of 1.5 µg/mL, acting through direct virucidal mechanisms to inhibit viral entry. Further fractionation provided the FR3T3 sub-fraction (IC50 = 4.7 µg/mL), which harbors terpenoids and chlorophylls that can interfere with post-entry events, such as NS3 protein expression and RNA replication. Notably, the crude DCM fraction showed synergistic antiviral activities when co-administered with conventional therapies such

as Ribavirin, Simeprevir, and Cyclosporin A. Taken together, these findings suggest that *Artocarpus heterophyllus* derivatives may be useful, cost-effective candidates for adjunctive therapies in the treatment of chronic HCV infections.[26,27]

4. Antioxidant activity

The antioxidant potential of *Artocarpus heterophyllus* is quite high due to its ability to neutralize reactive oxygen species and provide protection against conditions related to oxidative stress, such as cancer, diabetes, and cardiovascular diseases. Studies have shown that seeds, bark, and leaves were evaluated using Soxhlet extraction and hot percolation methods, using solvents such as ethanol, methanol, and ethyl acetate. The ethanolic extracts of seeds[28] showed the highest phenolic content (4.16 mg/g GAE) and flavonoid content (4.05 mg/g QE) with IC50 of 300 µg/mL in DPPH scavenging activity. In the bark,[29] the ethyl acetate extract showed the highest phenolic content of 191.60 mg GAE/g, while the methanolic extract showed potent activity comparable to that of standard ascorbic acid. In the leaves,[30] the methanolic extract showed phenolic content of 164.04 mg GAE/g with significant radical scavenging activity with IC50 of 20.99 µg/mL in DPPH. These studies clearly show that the jackfruit tree is a high-potential source of natural antioxidants.

5. Anti-inflammatory activity

Artocarpus heterophyllus has long been recognized for its effectiveness in the treatment of inflammatory diseases and edema. Modern studies have confirmed the traditional use of *Artocarpus heterophyllus*, ascribing its anti-inflammatory properties to the high concentration of active artocarpin and polyphenols. In assessing the anti-inflammatory activity, methanolic extracts of the plant's leaves and wood pulp were used. The extracts were tested in an in vitro human red blood cell (HRBC) membrane stabilization assay under hypotonic conditions, as well as in an in vivo mouse model of colitis-related cancer induced by azoxymethane (AOM) and dextran sodium sulfate (DSS). The findings showed that the leaf extract exhibited a significant protective effect on cell membranes from lysis in a dose-dependent manner, while the wood extract showed a substantial reduction in the gene expression of pro-inflammatory cytokines Il-6 and Ifn-γ. The active compounds of *Artocarpus heterophyllus* make it a promising natural remedy for the treatment of chronic inflammatory diseases.[30,31]

6. Hepatoprotective activity

The hepatoprotective potential of *Artocarpus heterophyllus* is of immense value in maintaining liver integrity and function after exposure to hepatotoxic substances such as CCl4, cyclophosphamide, and testosterone propionate. The studies were conducted on aqueous extracts and purified polysaccharides from seeds, leaves, and the pulp of fleshy fruits of *Artocarpus heterophyllus* in Swiss albino mice and Wistar rats. Aqueous extracts significantly reduced carbon tetrachloride induced hepatotoxicity by normalizing alkaline phosphatase (ALP) and alanine aminotransferase (ALT) activities. In pulp-derived extracts, purified polysaccharides reversed cyclophosphamide-induced hepatotoxicity by inhibiting MAPK-mediated inflammatory pathways and by significantly increasing superoxide dismutase and catalase activities. In leaves and seeds, aqueous extracts significantly reduced enzyme leakage, and histopathological studies revealed the maintenance of hepatocytes and portal venules. Taken together, these findings indicate that the leaves, seeds, and pulp of *Artocarpus heterophyllus* are a valuable natural resource for maintaining liver architecture and function.[32-34]

7. Anti-platelet activity

Studies on natural antithrombotics have emphasized the strong fibrinolytic and fibrinogenolytic properties of *Artocarpus heterophyllus* seed extracts. An aqueous seed extract (AqSEJ) was evaluated for its effect on coagulation factors using in vitro human fibrinogen and plasma clot models. The results showed that the extract non-specifically hydrolysed the Aα, Bβ, and γ chains of fibrinogen and specifically degraded the α polymer and α chain of fibrin clots. This process is mainly due to serine and cysteine proteases, which directly dissolve the clots without activating plasminogen. Furthermore, in vivo toxicity studies in mice showed that the extract does not cause hemorrhage, edema, or hemolysis, suggesting that it is safe at therapeutic concentrations. Taken together, these findings suggest that the extract can disrupt the integrity of clots, which is a potent approach for the treatment of thrombotic conditions.[35]

8. Wound healing

The evaluation of botanicals for wound healing has revealed the therapeutic potential of *Artocarpus heterophyllus* leaves in the treatment of oral complications. In the current research, an ethanolic leaf extract gel was used on a diabetic Wistar rat model after tooth extraction. Topical use at a 15% dose showed a substantial increase in Superoxide Dismutase (SOD) activity and a decrease in Interleukin-1β (IL-1β) levels.

This is attributed to the flavonoid and saponin compounds that counteract the inflammatory mediators and neutralize the reactive oxygen species. The drug efficiently shortens the inflammatory phase, allowing the wound to progress quickly into the proliferative phase.

Therefore, *Artocarpus heterophyllus* leaf extract can be considered a valuable herbal supplement for quick wound healing in diabetic patients.[36]

9. Anti-bacterial activity

The antimicrobial activity of *Artocarpus heterophyllus* shows a remarkable variability, which suggests its potential use as a multi-purpose drug. In this study, methanolic and ethyl acetate extracts were obtained from

the bark, seeds, fruits, and heartwood of *Artocarpus heterophyllus*, and their inhibitory effect was determined by the disc diffusion and broth microdilution methods.

The quantitative analysis showed that the butanol fractions and isolated flavonoids, particularly artocarpin, artocarpesin, and dihydromorin, reached a minimum inhibitory concentration (MIC) of 3.13 µg/mL. The active compounds were found to be particularly effective against Gram-positive bacteria and cariogenic bacteria such as Streptococcus mutans and Streptococcus pyogenes, and the results were attributed to specific polyhydroxyl moieties and aliphatic substituents of the flavonoid rings.[37-39]

10. Anti-microbial activity

The results obtained from the study of *Artocarpus heterophyllus* validate its antimicrobial and antibiofilm properties against various bacterial pathogens. The ethanolic stem bark extract and methanolic leaf extract of *Artocarpus heterophyllus* were tested using disc diffusion, MIC, and biofilm inhibition assays against Escherichia coli and Pseudomonas aeruginosa (PAO1).

The results show that the ethanolic stem bark extract possessed strong antibacterial properties with an MIC of 0.5 mg/mL, while the methanolic leaf extract showed growth inhibition at 10 mg/mL.

Importantly, sub-inhibitory concentrations of the leaf extract inhibited biofilm formation by 55.12% by interfering with the quorum sensing mechanisms of LasI/LasR and RhlI/RhlR, respectively, without affecting the planktonic cell viability. These properties can be ascribed to the high content of flavonoids, phenols, and terpenoids that repress the expression of virulence factors and disrupt the integrity of the bacterial cell membrane.

Therefore, *Artocarpus heterophyllus* can be considered a potential botanical resource for the development of natural antimicrobial agents and antibiotic adjuvants to combat drug resistance.[40,41]

11. Anti-diarrhoeal activity

Research on *Artocarpus heterophyllus* has revealed the seeds and heartwood of the plant as promising natural resources for the treatment of infectious diarrheal diseases. In seed material evaluation studies, the use of ethanolic and hexanolic crude extracts was assessed through in vitro agar-well diffusion methods, which showed strong activity against methicillin-resistant Staphylococcus aureus and Pseudomonas aeruginosa.

The ethanolic seed extract showed the highest activity, with a minimum inhibitory concentration (MIC) of 31.25 mg/mL, due to its high tannin and flavonoid content. On the other hand, heartwood material studies utilized the isolated flavonoid artocarpanone against enteropathogenic bacteria in broth microdilution and time-kill studies. Artocarpanone showed strong bactericidal properties against Escherichia coli, with a remarkably low MIC of 3.9 µg/mL, achieved through the inhibition of membrane permeability and induction of cell lysis. The seed extracts were shown to be inactive against E. coli, but the heartwood-derived artocarpanone was able to overcome this shortcoming through its unique mechanism of action. Both plant materials provide a wide-spectrum botanical drug alternative for the treatment of drug-resistant diarrheal infections.[42,43]

12. Anti-malarial activity

The search for new antiplasmodial agents has led to the identification of *Artocarpus heterophyllus* and other species of this genus as potential leads for the treatment of malaria. In this experiment, the 80% ethanol extracts of the leaves and stem bark of A. heterophyllus and other species of Artocarpus were tested for their antiplasmodial activity using an in vitro Plasmodium falciparum (3D7) strain and an in vivo Plasmodium berghei (ANKA) mouse model. For A. heterophyllus, the leaf extracts showed promising activity with an IC50 of 9.35 µg/mL and an ED50 of 8.33 mg/kg, while the stem bark extracts showed IC50 and ED50 values of 12.18 µg/mL and 10.35 mg/kg, respectively. From the results, it was found that the leaves of Artocarpus altilis showed the highest potency, which is most likely due to the presence of bioactive prenylated flavones found in this genus. Therefore, Artocarpus leaf and bark extracts can be considered as promising botanical leads for the development of new antimalarial agents.[44]

13. Diuretic activity

The search for plant-derived drugs has led to the discovery of the leaves of *Artocarpus heterophyllus* as a potential natural diuretic. Using a normotensive Wistar rat model, the ethyl acetate fraction with a dose of 100 mg/kg showed a diuretic effect of 4.09, which was significantly higher than that of the standard drug furosemide. The extract caused a marked increase in the excretion of sodium, potassium, and chloride ions, with a pronounced inhibition of carbonic anhydrase enzyme activity. These properties can be ascribed to the total phenolic content of 51 mg GAE/g and the potential interaction with adenosine A1 receptors. Based on these properties, the leaves of *Artocarpus heterophyllus* can be considered a promising biopharmaceutical agent for the treatment of hypertension and fluid retention.[45]

14. Immuno-modulatory activity

The research on natural immunomodulators has revealed the immunostimulatory properties of *Artocarpus heterophyllus* leaves. The immunostimulatory activity of methanolic and aqueous extracts of *Artocarpus heterophyllus* leaves was evaluated using the swimming endurance test on Swiss albino mice. The extracts were given orally at a dose of 250 and 500 mg/kg body weight. Both extracts significantly increased the swimming time and survival time, thus showing increased resistance to physical stress. The methanolic extract at a dose of 500 mg/kg showed the highest

activity, with a mean swimming time of 329.0 minutes compared to the control group. These activities can be attributed to the high content of secondary metabolites in the plant, such as flavonoids and phenolic compounds.

Based on these findings, the leaf extracts of *Artocarpus heterophyllus* can be considered a promising botanical lead for the development of natural immunostimulatory agents.[46]

15. Anti-fungal activity

Studies on plant defensive mechanisms have highlighted the antifungal properties of specific proteins found in the Artocarpus species. Two new chitin-binding lectins, named jackin and frutackin, were purified from the saline crude extract of seeds of Artocarpus integrifolia and *Artocarpus heterophyllus*. In vitro germination and hyphal extension experiments showed that these lectins can significantly reduce the growth of Fusarium moniliforme and Saccharomyces cerevisiae. Specifically, jackin was able to prevent the germination of F. moniliforme at a concentration of 2.25 mg/mL by binding to the chitin present in the cell walls and preventing the normal development of the hyphae. These 14 kDa proteins have a high thermal stability, remaining stable even at 80°C, and a unique three-chain structure with a high content of β-sheets. Therefore, these lectins can be considered a highly effective and eco-friendly alternative for the control of phytopathogenic fungi.[47]

16. Anthelmintic activity

The quest for natural anthelmintics led to the identification of *Artocarpus heterophyllus* leaves as a potential natural alternative for the control of gastrointestinal nematodes in ruminants. The crude aqueous leaf extract was tested using an in vitro Haemonchus contortus bioassay, with adult worms obtained from infected goat abomasa. Quantitative analysis showed a high tannin content of 23.56 mg/g, which made it easier to disrupt the worm cuticle and inactivate wall-associated proteins. At an optimal concentration of 1.25%, the extract caused 100% mortality in four hours and induced significant morphometric alterations in the worms, including decreases in body length and dimensions of the spicule or vulvar flap. Notably, this natural product was as effective as the commercial anthelmintic albendazole, which also caused 100% mortality in four hours. Taken together, aqueous leaf extracts of *Artocarpus heterophyllus* are a promising and sustainable biopharmaceutical lead for the control of haemonchosis in small ruminants.[48]

17. Inhibition of melanin synthesis

The screening of natural whitening agents has revealed the high anti-melanogenic activity of *Artocarpus heterophyllus* wood extracts. The methanol extracts of the sapwood were used, and the diethyl ether-soluble fraction led to the isolation of a new prenylated flavone, named 3-prenyl luteolin. The IC50 value of 76.3 μM was obtained using the mushroom tyrosinase model, while the B16 melanoma cell assays showed an IC50 of 56.7 μM for the inhibition of melanin. Notably, the compound showed low cytotoxicity, retaining 95% cell viability, and the results suggest that the C-3 prenyl group is a crucial component for the inhibition of tyrosinase activity. Therefore, 3-prenyl luteolin is a promising natural compound for the treatment of hyperpigmentation in skin-lightening cosmetics.[49]

18. Effect on Sexual behaviour

Roasted seeds of *Artocarpus heterophyllus* Lam. have aphrodisiac properties, as stated in a medicinal plants guide for Sri Lanka. However, some young men with reproductive capability in rural Sri Lanka claim that the consumption of these seeds a few hours prior to sexual activity interferes with sexual performance. In view of the conflicting observations, a scientific assessment of the effects of A. heterophyllus seeds on male sexual performance and fertility was made. A suspension of seeds (SS) in 1% methylcellulose was used and given to rats. In a sexual behavior test using sexually receptive females, an oral dose of 500 mg/kg SS significantly decreased libido, sexual arousal, sexual vigor, and sexual performance in 2 hours, and caused mild erectile dysfunction. These anti-masculine actions on sexual performance were not observed at 6 hours post-administration, indicating rapid onset and offset of action. Furthermore, these actions on sexual behavior were not due to general toxicity, hepatotoxicity, stress responses, or decreased plasma testosterone levels, but to marked sedative effects. In a mating test, SS failed to alter ejaculatory ability and fertility. These results indicate that A. heterophyllus seeds lack aphrodisiac properties in the rat model.[50]

CONCLUSION

Artocarpus heterophyllus is an important medicinal plant which is a source of beneficial metabolites, including flavonoids, tannins, stilbenoids, phenolic acids, terpenoids, and alkaloids. According to our review, *Artocarpus heterophyllus* has biologically significant activity—including anti-diabetic, anti-cancer, anti-viral, and antioxidant properties—that can successfully protect people against a range of illnesses.

Since the plant is readily available and widely distributed across tropical regions, often termed "poor man’s food," it remains a highly accessible option to treat various ailments. It possesses a wide range of pharmacological actions, such as hepatoprotective, wound healing, and anti-inflammatory effects, that may be therapeutically beneficial. The plant also demonstrates anti-platelet, anti-malarial, and diuretic activities, along with the ability to inhibit melanin synthesis.

This review provides information about the significance of *Atibruhatphala*. *Artocarpus heterophyllus* is possibly a "treasure house" of therapeutic components that

effectively cures a wide range of diseases in an astounding way.

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REFERENCES

1. Canter PH, Thomas H, Ernst E. Bringing medicinal plants into cultivation: opportunities and challenges for biotechnology. TRENDS in Biotechnology, 2005 Apr 1; 23(4): 180-5.
2. PATIL KS, Jadhav AG, Joshi VS. Wound healing activity of leaves of *Artocarpus heterophyllus*. Indian journal of pharmaceutical sciences, 2005; 67(5): 629-32.
3. Baliga MS, Shivashankara AR, Haniadka R, Dsouza J, Bhat HP. Phytochemistry, nutritional and pharmacological properties of *Artocarpus heterophyllus* Lam (jackfruit): A review. Food research international, 2011; 44(7): 1800-11.
4. Muralidharan VK, Ganapathy MM, Velayudhan KC, Amalraj VA. Collecting jackfruit germplasm in Western Ghats. Indian Journal of Plant Genetic Resources, 1997; 10(2): 227-31.
5. Pradeepkumar T. Management of horticultural crops. New India Publishing, 2008 Jan 5.
6. Prakash O, Kumar R, Mishra A, Gupta R. *Artocarpus heterophyllus* (Jackfruit): an overview. Pharmacognosy reviews, 2009; 3(6): 353.
7. Elevitch CR, Manner HI. *Artocarpus heterophyllus* (jackfruit). Species profiles for Pacific Island agroforestry, 2006; 10: 1-25.
8. Jagtap UB, Bapat VA. *Artocarpus*: A review of its traditional uses, phytochemistry and pharmacology. Journal of ethnopharmacology, 2010; 129(2): 142-66.
9. Nguyen NT, Nguyen MH, Nguyen HX, Bui NK, Nguyen MT. Tyrosinase inhibitors from the wood of *Artocarpus heterophyllus*. Journal of natural products, 2012 Nov 26; 75(11): 1951-5.
10. Kumar A, Mishra A, Singh A. Phytochemistry, Pharmacological, Medicinal Significance of *Artocarpus heterophyllus* Lam. (Jackfruit). International journal of health sciences, 2022; 6(S5): 6578-90.
11. Panda RR, Pandey A, Gupta S, Bhatt KC. Use of fruit and seed characters for identification of edible Artocarpus species in India. Indian Journal of Plant Genetic Resources, 2023 Jul 21; 36(02): 309-12.
12. Reddy BM, Prakash Patil PP, Kumar SS, Govindaraju LR. Studies on physico-chemical characteristics of jackfruit clones of South Karnataka.
13. Azad AK, Jones JG, Haq N. Assessing morphological and isozyme variation of jackfruit (*Artocarpus heterophyllus* Lam.) in Bangladesh. Agroforestry Systems, 2007 Oct; 71(2): 109-25.
14. Khan AU, Ema IJ, Faruk MR, Tarapder SA, Khan AU, Noreen S, Adnan M. A review on importance of *Artocarpus heterophyllus* L. (Jackfruit). Journal of Multidisciplinary Applied Natural Science, 2021 Jul 30; 1(2): 106-16.
15. Gupta A, Marquess AR, Pandey AK, Bishayee A. Jackfruit (*Artocarpus heterophyllus* Lam.) in health and disease: a critical review. Critical reviews in food science and nutrition, 2023 Sep 10; 63(23): 6344-78.
16. Buddhisuharto AK, Pramastya H, Insanu M, Fidrianny IJ. An updated review of phytochemical compounds and pharmacology activities of Artocarpus genus. Biointerface Res Appl Chem, 2021; 11(6): 14898-905.
17. Swami SB, Thakor NJ, Haldankar PM, Kalse SB. Jackfruit and its many functional components as related to human health: a review. Comprehensive Reviews in Food Science and Food Safety, 2012 Nov; 11(6): 565-76.
18. Ranasinghe RA, Maduwanthi SD, Marapana RA. Nutritional and health benefits of jackfruit (*Artocarpus heterophyllus* Lam.): a review. International journal of food science, 2019; 2019(1): 432
19. Ajiboye BO, Ojo OA, Oyinloye BE, Okesola MA, Oluwatosin A, Boligon AA, Kappo AP. Investigation of the in vitro antioxidant potential of polyphenolic-rich extract of *Artocarpus heterophyllus* lam stem bark and its antidiabetic activity in streptozotocin-induced diabetic rats. Journal of evidence-based integrative medicine, 2020 May 15; 25: 2515690X20916123.
20. Ajiboye BO, Ojo OA, Adeyonu O, Imiere O, Olayide I, Fadaka A, Oyinloye BE. Inhibitory effect on key enzymes relevant to acute type-2 diabetes and antioxidative activity of ethanolic extract of *Artocarpus heterophyllus* stem bark. Journal of acute disease, 2016 Sep 1; 5(5): 423-9.
21. Biworo A, Tanjung E, Iskandar K, Suhartono E. Antidiabetic and antioxidant activity of jackfruit (*Artocarpus heterophyllus*) extract. Journal of Medical and Bioengineering, 2015 Aug; 4(4).
22. Ajiboye BO, Ojo OA, Adeyonu O, Imiere O, Oyinloye BE, Ogunmodede O. Ameliorative activity of ethanolic extract of *Artocarpus heterophyllus* stem bark on alloxan-induced diabetic rats. Advanced pharmaceutical bulletin, 2018 Mar 18; 8(1): 141.
23. Arung ET, Wicaksono BD, Handoko YA, Kusuma IW, Shimizu K, Yulia D, Sandra F. Cytotoxic effect of artocarpin on T47D cells. Journal of natural medicines, 2010 Oct; 64(4): 423-9.
24. Patel RM, Patel SK. Cytotoxic activity of methanolic extract of *Artocarpus heterophyllus* against A549, Hela and MCF-7 cell lines. Journal of

Applied Pharmaceutical Science, 2011 Sep 30(Issue): 167-71.
25. Burci LM, da Silva CB, Rondon JN, da Silva LM, de Andrade SF, Miguel OG, Dias JD, Miguel MD. Acute and subacute (28 days) toxicity, hemolytic and cytotoxic effect of *Artocarpus heterophyllus* seed extracts. Toxicology reports, 2019 Jan 1; 6: 1304-8.
26. Hafid AF, Aoki-Utsubo C, Permanasari AA, Adianti M, Tumewu L, Widyawaruyanti A, Wahyuningsih SP, Wahyuni TS, Lusida MI, Hotta H. Antiviral activity of the dichloromethane extracts from *Artocarpus heterophyllus* leaves against hepatitis C virus. Asian Pacific Journal of Tropical Biomedicine, 2017 Jul 1; 7(7): 633-9.
27. Permanasari AA, Aoki-Utsubo C, Wahyuni TS, Tumewu L, Adianti M, Widyawaruyanti A, Hotta H, Hafid AF. An in vitro study of an *Artocarpus heterophyllus* substance as a hepatitis C antiviral and its combination with current anti-HCV drugs. BMC Complementary Medicine and Therapies, 2021 Oct 12; 21(1): 260.
28. Shanmugapriya K, Saravana PS, Payal HA, Mohammed SP, Binnie WI. Antioxidant activity, total phenolic and flavonoid contents of *Artocarpus heterophyllus* and Manilkara zapota seeds and its reduction potential. International Journal of Pharmacy and Pharmaceutical Sciences, 2011; 3(5): 256-60.
29. Yadav N, Saxena J, Maheshwari M. QUALILATIVE SCREENING AND EVALUATION OF ANTIOXIDANT ACTIVITY OF *ARTOCARPUS HETEROPHYLLUS* BARK. Journal of Advanced Scientific Research, 2021 Nov 30; 12(04): 227-32.
30. Thakur NE, Bashir SF, Kumar GA. Assessment of phytochemical composition, antioxidant and anti-inflammatory activities of methanolic extracts of Morus nigra and *Artocarpus heterophyllus* leaves. Inflammation, 2020; 6(7).
31. Morrison IJ, Zhang J, Lin J, Murray JE, Porter R, Langat MK, Sadgrove NJ, Barker J, Zhang G, Delgoda R. Potential chemopreventive, anticancer and anti-inflammatory properties of a refined artocarpin-rich wood extract of *Artocarpus heterophyllus* Lam. Scientific Reports, 2021 Mar 25; 11(1): 6854.
32. Phukan H, Singha LI, Mitra PK. HEPATO-PROTECTIVE EFFECT OF AQUEOUS EXTRACT OF SEED, LEAF AND FRUIT OF JACKFRUIT (*ARTOCARPUS HETEROPHYLLUS* LAM.) AGAINST CCL4 INDUCED HEPATOTOXICITY ON SWISS ALBINO MICE. World J Pharm Res, 2018 Mar 9; 7(9): 766-9.
33. Cheng M, Zheng Y, Wu G, Tan L, Xu F, Zhang Y, Chen X, Zhu K. Protective effect of *Artocarpus heterophyllus* lam.(jackfruit) polysaccharides on liver injury induced by cyclophosphamide in mice. Nutrients, 2024 Jan 4; 16(1): 166.
34. Okolo LU, Uwakwe AA, Anacletus FC, Nwauche KT. Hepatoprotective potentials of aqueous leaf and seed extracts of *Artocarpus heterophyllus* on testosterone propionate induced prostatitis in Wistar rats. Scientia Africana, 2023 Jun 14; 22(1): 317-34.
35. Sowmyashree Gangaraju SG, Bhagyalakshmi Manjappa BM, Subbaiah GK, Kemparaju Kempaiah KK, Shashidharamurthy R, Plow JH, Martin SS, Manohar Shinde MS, Devaraja Sannaningaiah DS. Jackfruit (*Artocarpus heterophyllus*) seed extract exhibits fibrino (geno) lytic activity.
36. Amin AH, Pamasja YA. The effect of jackfruit (*Artocarpus heterophyllus*) leaf ethanolic extract gel on superoxide dismutase and interleukin-1β levels in wound healing after tooth extraction in diabetic rats. InProceedings of the 1st Jenderal Soedirman International Medical Conference in conjunction with the 5th Annual Scientific Meeting (Temilnas) Consortium of Biomedical Science Indonesia (JIMC 2020), 2021 (pp. 164-169).
37. Khan MR, Omoloso AD, Kihara M. Antibacterial activity of *Artocarpus heterophyllus*. Fitoterapia, 2003 Jul 1; 74(5) z: 501-5.
38. Sato M, Fujiwara S, Tsuchiya H, Fujii T, Iinuma M, Tosa H, Ohkawa Y. Flavones with antibacterial activity against cariogenic bacteria. Journal of ethnopharmacology, 1996 Nov 1; 54(2-3): 171-6.
39. Septama AW, Jantan I, Panichayupakaranant P, Aluwi MF, Rahmi EP. Immunosuppressive and antibacterial activities of dihydromorin and norartocarpetin isolated from *Artocarpus heterophyllus* heartwoods. Asian Pacific Journal of Tropical Biomedicine, 2020 Aug 1; 10(8): 361-8.
40. Soni M, Naseef Pathoor N, Viswanathan A, Veeraragavan GR, Sankar Ganesh P. Exploring the antimicrobial and antibiofilm activities of *Artocarpus heterophyllus* Lam. against Pseudomonas aeruginosa PAO1. World Academy of Sciences Journal, 2024 Jul 11; 6(5): 50.
41. Sivagnanasundaram P, Karunanayake KO. Phytochemical screening and antimicrobial activity of *Artocarpus heterophyllus* and Artocarpus altilis leaf and stem bark extracts. OUSL Journal, 2015 Dec 16; 9.
42. Septama AW, Panichayupakaranant P. Antibacterial activity of artocarpanone isolated from *Artocarpus heterophyllus* heartwoods against diarrheal pathogens and its mechanism of action on membrane permeability. Journal of Applied Pharmaceutical Science, 2017 Nov 30; 7(11): 064-8.
43. Eve A, Aliero AA, Nalubiri D, Adeyemo RO, Akinola SA, Pius T, Nabaasa S, Nabukeera S, Alkali B, Ntulume I. In vitro antibacterial activity of crude extracts of *Artocarpus heterophyllus* seeds against selected diarrhoea-causing superbug bacteria. The Scientific World Journal, 2020; 2020(1): 9813970.
44. ACHMAD FH, RIA PS, LINTANG HF, NINIET F, DIMAS R, ATY W. Antimalarial activity of crude extracts of *Artocarpus heterophyllus*, Artocarpus altilis and Artocarpus camansi. Asian Journal of

Pharmaceutical and Clinical Research, 2015 Dec 3; 9: 279-81.
45. Amriani A, Novita RP, Gabriella R, Lestari SV, Agustina A. The diuretic effect of ethyl acetate fractions of Artocarpus altilis, Artocarpus champeden, and *Artocarpus heterophyllus* leaves in normotensive Wistar rats. Journal of Ayurveda and Integrative Medicine, 2023 Jul 1; 14(4): 100746.
46. Prakash O, Kumar A, Kumar P. Screening of analgesic and immunomodulator activity of *Artocarpus heterophyllus* Lam. leaves (Jackfruit) in mice. Journal of Pharmacognosy and Phytochemistry, 2013 Mar 1; 1(6).
47. Trindade MB, Lopes JL, Soares-Costa A, Monteiro-Moreira AC, Moreira RA, Oliva ML, Beltramini LM. Structural characterization of novel chitin-binding lectins from the genus Artocarpus and their antifungal activity. Biochimica et Biophysica Acta (BBA)-Proteins and Proteomics, 2006 Jan 1; 1764(1): 146-52.
48. Widiarso BP, Dewi DA, Sarwendah K, Pratiwi DE. In vitro potency of a crude aqueous extract of *Artocarpus heterophyllus* leaves as an anthelmintic against haemonchus contortus in jawarandu goats. Adv. Anim. Vet. Sci., 2021; 9(9): 1498-503.
49. Arung ET, Shimizu K, Tanaka H, Kondo R. 3-Prenyl luteolin, a new prenylated flavone with melanin biosynthesis inhibitory activity from wood of *Artocarpus heterophyllus*. Fitoterapia, 2010 Sep 1; 81(6): 640-3.
50. Ratnasooriya WD, Jayakody JR. *Artocarpus heterophyllus* seeds inhibits sexual competence but not fertility of male rats. Indian journal of experimental biology, 2002 Mar 1; 40(3): 304-8.