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Research Paper

Environment

Kathal- its medicinal uses

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ABSTRACT

Artocarpus heterophyllus (syn kathal) belonging to family Moraceae is an integral part of common Indian diet and is freely available in Indian and adjoining continents, its medicinal properties are also mentioned in Ayurveda. The plant is reported to possess antibacterial, anti inflammatory, anti-diabetic, antioxidant and immunomodulatory properties. Artocarpus heterophyllus is an important source of compounds like morin, dihydromorin, cynomacurin, artocarpin, isoartocarpin, cyloartocarpin, artocarpesin, oxydihydroartocarpesin, artocarpetin, norartocarpetin, cycloartinone, betulini acid, artocarpanone and heterophylol which are useful in fever, boils, wounds, skin diseases, convulsions, diuretic, constipation, ophthalmic disorders and snake bite etc.

KEYWORDS: Artocarpus hetrophyllus, Moraceae, Phytochemistry, Pharmocological activities.

Introduction:

The Artocarpus Heterophyllus is a species of tree of the mulberry family (Moraceae) is known by other names jackfruit (engl) Kathal, Panas (Hindi Kanthal (beng) Palla (tamil), Phanas (Guj and Mar) and Chakka (Malayalam). It is native to Western Ghats of India, Malaysia and also found in central and eastern Africa, south eastern Asia, the Caribbean, Florida, Brazil, Australia, Puerto Rico and many Pacific Islands. It is a large ever green tree, 10-15m in height, indigenous to the every green forests at altitude of 450-1200 m and cultivated throughout the hotter part of India. Stem of this plant is straight rough whereas bark is green or black, 1.25 cm thick, milky latex, leaves broad obovate, elliptic, decurrent, glabrous, entire inflorescene solitary axillaries, cauliforous and ramflours on short leafy shoots. Male head is sessile or on short pedunclesa receptacles, sometimes born on the ultimate twing. Female head are oblong avoid receptacle, syncarpus, cylindrics. Seeds are separated honry endocarpus enclosed by sub-gelatinous exocarpus (1mm thick) oblong ellipsoid in nature. The sweet yellow sheaths around the seeds are about 3-5 mm thick and have a taste similar to that of pineapple, but milder and less juicy.

Jackfruit (Artocarpus heterophyllus Lam) produces heavier yield than any other tree species, and bear the largest known edible fruit (up to 35 kg). The jackgfruit tree has several uses. Flakes of ripe fruits are high in nutritive value, every 100 g of rupe flakes contains 287-323 mg. potassium, 30.0- 73.2 mg calcium and 11-19 g carbohydrates. In Bangladesh, it is commonly referred to as "poor man food" as it is cheap and plentiful during the season. The nutritious seeds are boiled or roasted and eaten like chestnuts, added to flour for baking, or cooked in dishes. The tree is also known for its durable timber, which ages to an orange or reddish brown color, with anti-termite properties. The leaves and fruit waste provide valuable fodder for cattle, pigs and goats. Jackfruit wood chips yield a dye, which is used to give the famous orange red color to the robes of Buddhist priests. In addition, many parts of the plant, including the bark, roots, leaves and fruits have medicinal properties.

It requires a soil which is well drained but moist, with a ph of 4.3 to 8.0 and with medium soil fertility. The optimum temperature is 19 to 29 deg. C altitude at approx. 1600 meters above sea level and the annual rain fall between 1000 and 2400 mm.

Traditional uses

The leaves are useful in fever, boils, wounds and skin diseases. The young fruits are acrid, astringent and carminative. The ripe fruits are sweet, cooling, laxative, aphrodisiac and also used as a brain tonic. The seeds are, diuretic and constipating. The wood is nervine, antidiabetic, sedative and is useful in convulsions. The latex is useful in dysopia, ophthalmic disorders and pharyngitis and also used as antibacterial agent. The ash of Jackfruit leaves is used in case of ulcers. The dried latex yields artosteone, convertible to astoserone, and a compound with marked androgenic action. Mixed with vinegar, the latex promotes healing of abscesses, snakebite and glandular swellings. The root is a remedy for skin diseases and asthma. An extract of the root is taken in cases of fever and diarrhea. The bark is made into poultices. Heated leaves are placed on wounds. The woods has a sedative property and its pith is said to be abortifacient. Latex is used as an anti inflammatory agent.

Phytochemistry

The Artocarpus heterophyllus contains various chemical constituents as several flavones colouring matters, morin, dihy dromorin, cynomacurin, artocarpin (Figure 2) isoartocarpin, cyloartocarpin, artocarpesin, oxydihydroatocarpesin, artocarpetin, norartocarpetin, cyloartinone and artocarpanone. The heart wood on analysis yields moisture 6.7 % glucosides, 38.0% lipids, 0.7% albumin, 1.7% and cellulose 59.0. The plant also contains free sugar (sucrose), fatty acids, ellagic acid and some essential Amino acids like Argginine, Cystine, Histidine, Leucine, Lysine, Metheonine, Theonine, Tryptophan etc. Bark from main trunk contains betullic acid and two new flavones pigments, cycloheterophyllin (C30H30O7). Triterpenic compounds like cycloartenylacelate, cycloartenone are also reported Heterophylol a phenolic compound with novel skeleton was obtained from Artocaipus heterophyllus. There is only 3.3 % tannin in the bark, which is occasionally made into cordage or cloth. The leaves and stem show the presence of sapogenins, cycloartenone, cycloartenol, B, sitosterol and tannins they show estrogenic activity. A root contain B sitosterol ursolic acic, Betulinic acid and cycloartenone.

Jacalin, the major protein from the Artocarpus heterophyllus seeds, is a tetrameric two chain lectin combining a heavy chain of 133 amino acid residues with a light B chain of 20-21 amino acid residues. It is highly specific for the) glycoside of the disaccharide- Thomsen Friedenreich Antigen (GalB) 3 GalNAc) even in its sialylated form. This property as made jacalin suitable for studying various O linked glycoproteins, particularly human 1gAI. Jacalin's uniqueness in being strongly mitogenic for human CD4. T lymphocytes has made it is useful tool for the evaluation of the immune status of patients infected with human immunodeficiency virus HIV-1. Two novel 2, 4, 6- trioxygenated flavanoes. Heteroflavanoues A and B tetramethoxyflavanone and 8 dimethylally) 5 hydroxy 7.2, 4.6- tetramethoxyflavanone. Three phenolic compounds were characterized as artocarpesin (5,7,2,4- tetrahydroxy 6 B, methybut 3 enyl) flavones) norartocarpetin 5.7, 2.4 tetrahydroxyflavone and oxyresveratrol(trans-2, 4,3,5 tetrahydroxystilbene) by spectroscopic methods and through comparison with data reported in the literatures. The anti inflammatory effects of these isolated compounds were evaluated by determining their inhibitory effects on the production of proinflammtory mediators in lipopolysaccharide (LPS) activated RAW 264.7 murine macrophage cells. These three compounds exhibited potent anti inflammatory activity. The composition of carotenoids of A heterophllus is carotenes B carotene a carotene B zecarotene, a- zeacarotenae and B carotene, 5-6 epoxide and a dicarbodylic carotenoid, crocetin were identified.

Flowers

This species is monoecious, having male and female inflorescences (or spikes) on the same tree. Male and Female spikles are borne separately on short, stout stems that sprout from older branches and the trunk. Male spikes are found on younger branches above female spikes. Male spikes are dense, fleshy, cylindrical to club shaped, and up to 10 cm (4 in) in length. Flowers are tiny, pale green, when young, turning darker

with age. Female flowers are larger, elliptic or rounded, with a tubular calyx. .

Leaves
Leaves are dark green, alternate, entire, simple, glossy, leathery, stiff, large (upto 16 cm (6 in) in length and elliptic to oval in form leaves are often deeply lobed when juvenile and on young shoots.

Fruit
Jackfruit has a compound or multiple fruit (syncarp) with a green to yellow brown exterior rind that is composed of hexagonal, bluntly carpel apices that cover a thick, rubbery, whitish to yellowish wall. The acid to sweetish (when ripe) banana flavored flesh (aril) surrounds each seed. The heavy fruit is held together by a central fibrous core. Fruits are oblong cylindrical in shape, typically 30-40 cm (12-16 in) in length.

Seeds
Seeds are light brown, rounded, 2-3 cm (0.8-1.2in) in length by 1-1.5 cm (0.4-0.6 in) in diameter, and enclosed in a thin, whitish membrane, Upto 500 seeds can be found in each fruit. Seeds are recalcitrant and can be stored up to a month in cool, humid conditions. Although a lot of pharmacological investigations have been carried out based on the constituents present in it but a lot more can still be explored and utilized in a therapeutic manner.

Anti inflammatory effect
Arlocarpus heterophyllus Lam is a large ever green tree cultivated through out Southeast Asia for its fruits. Its leaves nad roots have been used for medicinal purposes. The aim of this work was to study the in vitro anti inflammatory effects of phenolic compounds isolated from the ethyl acetate extracts of the fruits of Artocarpus heterphyllus. Three phenolic compounds were characterized as astocarpesin (5, 7, 2,4- tetrahydroxy 6 Bmethy but 3 enyl) flavones. Norartocarpetin 5,7,2,4 tetrahydroxy flavones and oxyresveratrol trans 2,4,3 5 tetrahydroxystine by spectroscopic methods and through comparison with data reported in the litera literatures. The anti inflammatory effects of the isolated compounds were evaluated by determining their inhibitory effects on the production of proinflammtory mediators in lipopolysaccharide (LPS) activated RAW 264.7 murine macrophage cells. These three compounds exhibited potent anti inflammatory activity

Antioxidant effect
The antioxidant properties of prenyflavones, isolated from Artocarpus heterophyllus Lam, were evaluated in this study. Among them, artocarpine, artocarpetin, artocarpetin A and cycloheterophyllin diacetate and peracetate had no effect on iron induced lipid peroxidation in rat brain homogenate.

Antifungal effect
Two novel chitin-binding lectins from seeds of Artocarpus genus were described, one from jack fruit and from breadfruit. They were purified from saline crude extract of seeds using affinity chromatography on chitin column, size exclusion chromatography and reverse phase chromatography on the C-18 column. Both are 14 KDa proteins, made up of 3 chains linked by disulfide bonds.

Immunomodulatory effect
Jacalin, the major protein from the jack fruit (Artocarpus heterophyllus) seeds, is a tetrameric two chain lectin (molecular mass 65 kda) combining a heavy chain of 133 amino acid residues with a light B chain of 20-2) amino acid residues.

Antidiabetic Effect
Investigations were carried out to evaluate the effect of hot water extract of artocarpus heterophyllus leaves on the glucose tolerance of normal human subjects and maturity onset diabetic patients. The extracts of Artocarpus heterophyllus significantly improved glucose tolerance in the normal subjects and the diabetic patients when investigated at oral doses equivalent to 20 g/kg of starting material.

Antibacterial effect
The crude methaolic extracts of the stem and root, barks, stem and root heat wood, leaves, fruits and seeds of Artocarpus heterophyllus and their subsequent partitioning with petrol, dichloromethane, ethyl acetate and butanol gave fractions that exhibited a broad spectrum of antibacterial activitity.

Some chemical constituents isolated from A Heterophyllus
Six prenyflavonoids including two new compounds, have been isolated from the root, bark of Artocarpus heterophyllus. The new prenylflavones have been characterized as 8 (y.y dimenthylally) 5,4″ dihydroxy-7.2′ dimenthoxyflavone and 3.3′ di (yy dimethylally) 5,7,2,5′ tetrahydroxy 4- methoxyflavone respectively.

In an investigation emission and fourier transform infrared spectra of the jack fruit seeds, in powdered form, were recorded. Analysis of the emission spectrum confirms the presence of two hitherto undetected elements, manganese and magnesium. The fourier transform infrared spectrum reveals the presence of some specific functional groups, attributed to the different bands present in the spectrum.

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