

PHCOG MAG.: Plant Review

Pharmacological potential of *Albizzia lebeck*: A Review

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ABSTRACT - The plant *Albizzia lebeck* Benth. [Mimosaceae] is reported to possess anti-asthmatic, anti-inflammatory, anti-fertility and anti-diarrhoeal properties. *Albizzia lebeck* is an important source of chemicals of melacacidin, D- catechin, β -Sitosterol, Albiziahexoside, betulnic acid which are effective as antiseptic, anti-dysenteric, anti-tubercular and used in bronchitis, leprosy, paralysis, helmenth infection etc. Hence in view of immense medicinal importance of the plant this review is therefore an effort to compile all the information reported on its phytochemical and pharmacological activities these information will be helpful to create interest towards the plant and may be useful in developing new formulations, which are more effective and have more therapeutic value.

KEY WORDS - *Albizzia lebeck*, Mimosaceae, Albiziahexoside, anti-asthmatic

INTRODUCTION

India is one of the nations blessed with a rich heritage of traditional medical systems and rich biodiversity to complement the herbal needs of the treatment administered by these traditional medical systems. The recognized Indian Systems of Medicine are *Ayurveda*, *Siddha* and *Unani*, which use herbs and minerals in the formulations. India, which has 15 agro-climatic zones, 47000 plant species of which 15000 are reported to have medicinal properties varying degrees.

Albizzia lebeck is a tree well known in the Indian subcontinent for its range of uses. *Albizzia lebeck* Benth. [Mimosaceae] is a large, erect, unarmed, deciduous spreading tree. *Albizzia lebeck* is native to deciduous and semi deciduous forests in Asia from eastern Pakistan through India and Sri Lanka to Burma. In India it is known by various names in different regions viz. Sirish in Bengal, Begemara in Karnataka and Pilo-sarasio in Gujarat (1,2,3).

CLASSIFICATION (4)

Kingdom	- Plantae
Sub-kingdom	- Tracheobionta
Super division	- Spermatophyta
Division	- Magnoliophyta
Class	- Dicotyledonae
Subclass	- Polypetalae
Series	- Calciflorae
Order	- Rosales
Family	- Mimosaceae
Genus	- <i>Albizzia</i>
Species	- <i>Albizzia lebeck</i>

DESCRIPTION OF PLANT PARTS -

Stem is Large, erect and branched. The wood is light [sp. gr., 0.61; 624.78 kg / cu m] course - textured and has broadly and shallowly interlocked grain. The sapwood is white or yellowish white and the heartwood is dark brown streaked with. Leaves bipinnate, rachis 70-90 mm, rachillae 1-5 pairs, Leaflets 3-11 pairs, oblong to elliptic-oblong, asymmetrical, glabrous, entire, initially bright green and folding at night, maturing to

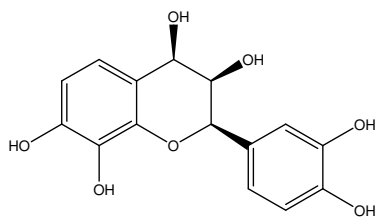
a duller glaucous green and fixed rachis. Inflorescence is globose heads. Flowers greenish-yellow to white, fragrant. Flowering is occurs in May to August. Fruits pod flat oblong, stiff-papery when ripe, swollen over seeds, dehiscent. Seeds 3-12 per pod, brown, flattened. Pod ripen during December to February.

It is reported to have many important medicinal properties. In the indigenous system of medicine *Albizzia lebeck* has been claimed to be useful in respiratory problem [Asthma], snake bite, scorpion sting and malaria/intermittent fever (5). The plant is reported to have antiseptic, anti-dysenteric and anti-tubercular properties. The bark has acrid taste. It is recommended for bronchitis, leprosy, paralysis and helminth infections.

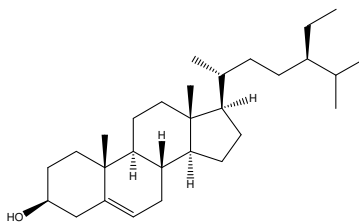
Leaves have been claimed to have anticonvulsant activity (5) and nootropic effect (6) which may be due to presence of certain important compound like alkaloids and flavanoids. Bark have immunomodulatory effect (7) and antimicrobial activity (8) while seed have anti-fertility effect (9) and anti-diarrhoeal activity (10). The main constituent of *Albizzia lebeck* are alkaloids, flavanoids, tannins, proteins and saponins.

PHYTOCHEMISTRY

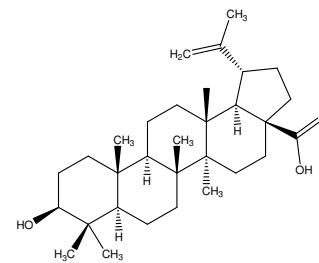
Work is done by many scientists in the field of phytochemical investigation of the plant. The phytochemical studies show the presence of the bark yields tannins 7-11% of condensed type, viz. D- catechin, Isomer of leucocyanidin [5,7,3',4'-tetrahydroxy flavon-3,4diol], Melacacidin, Leuco-anthra-cyanidin, Lebecacidin [8,3',4'- tri-hydroxyl flavon -3,4-diol], Friedelin, Beta- Sitosterol, Betulinic acid and its glycosides. Leaves are reported to contain - Caffeic acid, alkaloids, flavanoids [kaempferol and quercetin], Albizia-hexoside A(1) & A(2). The flowers on steam distillation gave a colorless, sweet-smelling oil[4.3%]. On fractionation, it yielded p-nitro benzoate, Benzyl alcohol and Benzoic acid and seeds contains Saponins, Budmunchiamine (1-3), N-dimethyl budmunchiamine(1).



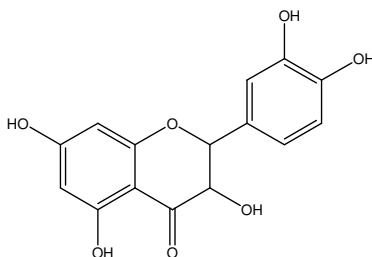
Melacacidin



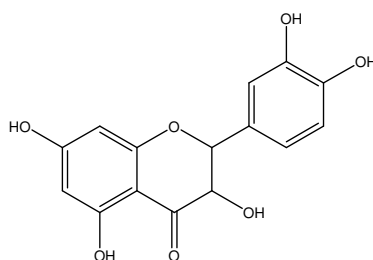
β -sitosterol



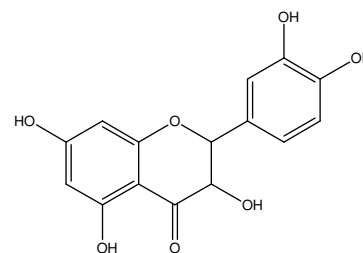
Betulinic acid



Kaempferol



Quercetin



Lupeol

Acyclic ester heneicos - 7 (z) enyl 24-hydroxy tetracos - 10 (z) enoate, in addition to lupeol, oleanolic acid, docosanoic acid and beta - sitosterol were isolated and characterised from the hexane extract of *Albizzia lebeck* pods,(11). Three main saponins named albizzia saponins A, B and C were isolated from the bark of *Albizzia lebeck*. Their structures were established through spectral analysis as acacic acid lactone 3-0-beta - D - xylopyranosyl (1 to 2) alpha L-arabinopyranosyl-(1 to 6) beta - D - glucopyranoside, 3-0-beta - D - glucopyranosyl (1 to 2) - 0 - [alpha - L - arabinopyranosyl] (1 to 6) beta D glucopyranoside and 3-0-beta - D - xylopyranosyl (1 to 2) alpha L-arabinopyranosyl - (1 to 6) beta - D - glucopyranoside, 3-0-beta-D-glucopyranosyl-(1to2) - 0 - [alpha L-arabinopyranosyl - (1 to 6) - beta - D - glucopyranoside and 3 - 0 - beta - D - xylopyranosyl (1 to 2) - alpha L - arabinopyranosyl - (1 to 6) - 0 [beta - D - glucopyranosyl] - (1to2)-beta-d-glucopyranoside (12).Methanolic extract of seed of *Albizzia lebeck* yielded three macrocyclic spermin alkaloids budmunchiamines 1-3 (13). From methanolic extract of seeds of *Albizzia lebeck* macrocyclic alkaloids named as budmunchiamine L4, L5, L6 were separated and structure was determined by Dixit and Misra (14). Phenolic glycoside, albizinin and four known flavon - 3-ols, (-) epicatechin, procyanidin B-2, procyanidin B-5, procyanidin C-1, were isolated from the acetone extract of bark of *Albizzia lebeck*,(15). Two new tri-o-glycoside flavonols, kaempferol and quercetin 3-0-alpha-rhamnopyranosyl [1 to 6] - beta - glucopyranosyl [1 to 6] - beta - galactopyranosides, were identified from the leaves of *Albizzia lebeck* (16).Albizziahexoside (1) a new hexaglycosylated saponin was isolated from leaves of *Albizzia lebeck* (17). Fatty acid composition of seed oil exclusively collected from the arid zone of Rajasthan have been investigated using GC / MS technique by M.M. Azam and M.R.K. Sherwani (18).

PHARMACOLOGY

In indigenous system of medicine, *Albizzia lebeck* has been claimed to be useful in respiratory problem [Asthma], snakebite, scorpion sting and malaria/intermittent fever. Anti-inflammatory activity of the *Albizzia lebeck* were assayed at a dose of 1000 mg / kg body weight of male albino rats using carragenin induced rat paw edema and it was found highly effective (19). Electrophoretic changes were observed on the protein profiles of somniferous tubules fluid and epididymal fluid from caput and caudo regions after the administration of alcoholic extract of dry seed of *Albizzia lebeck* (20). The chloroform fraction of methanolic extract of *Albizzia lebeck* leaves protected mice against maximal electroshocks (21). *Albizzia lebeck* fractions inhibited the passive cutaneous anaphylaxis, mast cell degranulation in rat dose dependently and could protect the sensitized guinea pig from antigen induced anoxic convulsion (22). The pharmacological study on antiasthma kada, which is a proprietary herbal combination, was carried out by V.S. Kasture et al. Results showed that composite drug was quite safe even in the dose of 1600 mg / kg body weight both in acute and subacute toxicity studies. In isolated frog heart, it produced dose dependent depression. In lower doses the drug behaved like acetylcholine but in higher doses direct action is predominant. Isolated rabbit heart also showed the same effect (23). The decoction of *Albizzia lebeck* stem bark was found to be effective against bronchospasm induced by histaminic acid phosphate and shown to exert di-sodium cromoglycate like action on mast cells. Results of clinical trials conducted with Sirisa Twak Kvatha on 19 Tamaka Shwasa patients was reported by C.C. Baruah (24).

Anti-diarrhoeal activity of the aqueous methanolic extract of seeds of *Albizzia Lebeck* was investigated employing five rodent diarrhoeal models. The aqueous extract [1-10mg/kg] was found to possess significant antidiarrhoeal activity,(25).The hot aqueous extract of the bark of *Albizzia*

lebbeck and its butanolic fraction were administered once daily for one week in mice at the dose level tested [6.25, 12.5 and 25mg / kg]. *Albizzia lebbeck* treated mice developed higher serum antibody and delayed type hypersensitivity response was suppressed (26). Hot aqueous extracts and butanolic fractions of *Albizzia lebbeck* were examined for the anti- PCA activity in mice and rats using guinea pig and rat anti-sera. At a dose rate of 50 mg / kg p.o., there was 74 and 66 percent activity respectively (27)

Anti-tumour activity of the ethanolic extracts of 12 medicinal plants of Bangladesh was studied using the potato disc bioassay technique. Among these 10 plants including *Albizzia lebbeck* extract of 25.0 µg / disc exhibited significant inhibition of crown gall tumours caused by *Agrobacterium tumefaciens* (28) The effect of saponin containing n-butanolic fraction [BF] extracted from dried bark of *Albizzia lebbeck* was studied on cognitive behavior and anxiety in albino mice. An elevated plus maze was used for assessment of both nootropic and anxiolytic activity. BF inhibited baclofen induced hypothermia and passivity (29). Oral administration of saponin isolated from *Albizzia lebbeck* bark at the dose level of 50 mg/kg per day to male a significant decrease in the weight of testes, epididymides seminal vesicle and ventral prostate (30). S.D. Chintawar, V.S. Kasture and S.D. Kasture studied effect of saponin containing n-butanolic fraction extracted from dried leaves of *Albizzia lebbeck* on learning and memory albino mice using passive shock avoidance paradigm and elevated plus maze. Significant improvement was observed. The mice treated with 100 mg / kg of BF showed 50 percent mortality (31). *Albizzia lebbeck* bark extract show the antimicrobial activity. The active constituent of bark extract is anthraquinone glycosides. The main constituent from bark is active against aerobes and mechanism of action is that glycosides cause the leakage of the cytoplasmic constituents (32).

CLINICAL STUDY

Clinical study of herbal and ayurvedic preparations of *Albizzia lebbeck* is carried out individually by B. Mukhopadhyay, M.A.Iyenger, Mahesh Chandra (33) and results show that these preparations are safe and effective. Treatment of allergic conjunctivitis by oral and local application of *Albizzia lebbeck* has been studied. This clinical study was done on 60 cases of various types of allergic conjunctivitis to assess the role of *Albizzia lebbeck* in the form of eye drop and capsule for a period of 60 days for treatment and further 90 days for follow up. Significant results were observed (33). The decoction of composite drug was administered to 14 patients of asthma in a dose of 30 ml t.i.d. or b.i.d and significant improvement in peak expiratory flow rate and eosinophil count were observed after 28 days of treatment. All patients showed clinical improvement in their symptoms of breathlessness, cough and wheezing. The combination is effective in the prophylaxis of asthma (34). Svasakuthararasa [ayurvedic formulation] is given to asthma patients and on comparison the effect of shirishadi kashaya (25 ml twice daily for 45 days) was found to be better than Svasakuthararasa (250 mg) with one cup of water twice daily for 45 days (35).

PHYSIOLOGY & BIOCHEMISTRY

Only little studies were carried in field of physiology and biochemistry on this plant. Abdul Rashed Miah and R Rao carried out work on regeneration of plantlets from excised roots of *Albizzia lebbeck* in vitro in presence of 2, 4-D, indole butyric acid [IBA], indole acetic acid [IAA]. Root explants from 15 days old seedling of *Albizzia lebbeck* produced 15-17 shoots when cultured on BS [Gambarg] medium supplemented with BAP [4mgL-1] and 2,4-D [2mgL-1]. The excised shoots were successfully rooted on half strength MS medium containing IBA [1 mg L-1] and IAA [1mgL-1],(36). A.K.Tripathi and S. Tripathi report the effect of heavy metals such as Ni (II), Cr (VI) and Hg on biochemical and chemical parameters of *Albizzia lebbeck* and significant reduction in chlorophyll, protein, carbohydrates and sugar in leaves was observed (37).The effect of growth regulating hormone indole butyric acid (IBA) was studied on various plants like Arjun, *Cassia siamea*, Jamun and Siris (*Albizzia lebbeck*) .The IBA increase the rooting and survival of air layers in *Albizzia lebbeck* at concentration of 7500 ppm,(38).The effect of coppicing on *Albizzia lebbeck* at different height and evaluation of response is studied and when coppicing at height 90 cm is carried out it show the increased biomass production and highest regeneration (39). Seasonal variation in chemical composition, dry matter and nutrient concentration in *Albizzia lebbeck* was evaluated by A.K. Singh et.al. . March - June was found to be suitable for lopping the tree leaves to feed the live stock (40).

PHARMACOGNOSY

Panchvalkal is a mixture of five bark powders namely *Ficus bengalensis*, *Ficus religiosa*, *Ficus glmoerata*, *Ficus infectoria* and *Albizzia lebbeck*. Panechvalkal is known to possess wide spectra of therapeutic use. The study was undertaken to prepare a standardized vaginal tablet from alcoholic extract of panchvalkal. The phytosterols in the panchvalkal were analysed from tablet by using HPTLC technique (41). The stability of the poly herbal capsule by exposing it to elevated condition of temperature i.e. 45°C and 40°C with 75 percent relative humidity was studied. The sample periodically analysed up to six month for their organoleptic characteristics assay of few plant ingredient. The change in quantifiable components was with in 90 percent of the initial amount, indicating the stability of product for more than three years at room temperature(42).

DISEASES AND PEST

Several diseases and pests are reported on *Albizzia lebbeck*. Establishment can be affected by attack on young plants by mice or rabbits, marsupials and domestic ruminants. Leaves are largely unaffected by insects, but young leaves may be subject to heavy predation by larvae of the grass yellow butterfly (*Eurema hecoba*). This appears to be a very short-lived effect. The most serious pests are bark-feeding larvae of *longicorn* beetles. These do not affect small stems and have little effect on large stems, but complete girdling can cause dieback in stems in the diameter range 40-100 mm. Several insects of the order *Coleoptera*, *Lepidoptera* and *Hemiptera* attack *Albizzia lebbeck*. In *Albizzia lebbeck*, the seed destruction by *Bruchidius* reduces the percentage fertility of

an other wise efficient plant. The majority of bruchids infest legume in the field and have long been recognized as serious pest of stored peas, beans etc. This study deals with seed destruction in *Albizzia lebbbeck* by the infestation of bruchidius spp. and an involvement of parasite pteromalus sequester in the process of infestation, (43).

CONCLUSION

Albizzia lebbbeck is quick-growing and popular tree. It is a traditionally important medicinal plant .

- *Albizzia lebbbeck* produce anti-inflammatory, antispermatogenic, antiandrogenic, anticonvulsant, mast cell stabilizing, antitumour, notepad activity.
- *Albizzia lebbbeck* highly effective against the asthma.
- Many ayurvedic preparations containing *Albizzia lebbbeck* like Antiasthma kada, Sirisa twak kvatha, Vasadikwath available and found effective in management of asthma.
- Active constituent isolated from bark of *Albizzia lebbbeck* has antimicrobial activity and cause leakage of cytoplasmic constituent in microbes.
- *Albizzia lebbbeck* rich of chemical constituent which have therapeutic and medicinal value like D- catechin, melacacidin, leucoanthracyanidin, lebbecacidin, β -sitosterol, betulinic acid, caffeic acid, kaempferol, quercetin, lupeol and Albizziahexoside A(1) & A(2).

Most of pharmacological activities have been reported on *Albizzia lebbbeck* but hepatoprotective study not reported till date so there is an opportunity to work on it. *Albizzia lebbbeck* has great potential as anti asthmatic drug and it can play a important role in developing new formulation for treating inflammation, enhancing immunity and asthma. The detail research on isolation of bioactive chemicals and clinical study of plant extracts as well as ayurvedic/herbal formulation required.

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