

ALBIZIA LEBBECK : A SHORT REVIEW

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ABSTRACT : *Albizia lebeck (AL) commonly known as shirish, has number of therapeutic properties. AL is an economically important plant for industrial and medicinal uses. The leaves are good fodder with much protein content. The plant contains saponin, macrocyclic alkaloids, phenolic glycosides and flavonols. In Ayurvedic medicine, it is considered as an antidote against all type of poisons. Many ayurvedic formulation of shirish like Panch shirish agada, Mahagandhahasti Agad etc. have been indicated in poisoning. However, it has been established that no part of the plant has any antidotal value against either snake or scorpion venoms. In addition, the bark decoction of AL possesses anti-anaphylactic, anti-asthmatic activity and these potentials can be assumed as supportive measures in poisoning treatment. Saponin isolated from AL bark and methanolic pod extract of AL possess antispermatogenic effect. AL also has analgesic, anti-inflammatory anti-diarrheal, anxiolytic and nootropic activity.*

Key words: Saponin, Anaphylactic activity, Antidot

INTRODUCTION

There are huge number of herbal medicines described in ayurvedic and other alternative medicines whose popularity and use in uplifting the general health of common people is still not become so efficient as they due. Active constituents along with mineral, vitamins, oils present in the herbal medicines are much valuable for human being as well as animals. There are so many herbal medicines either individually or in combination which are being used in various medical treatise for the cure of different ailments. A. lebeck is one of them which are commonly used in ayurvedic and unani system of medicines.

The word albizzia has come from Albizzia an Italian naturalist of the eighteenth century[1]. AL is an exotic species whose invasion is from Australia to India. Its vernacular name is Shirish. There are some common names of AL given below:

Hindi-Garso, Siris, Sanskrit-Barhampuspha, Bhandi, Kalinga, Urdu-Darash, West Indies-Woman's Tongue, Brazil-Heart-to-black, Ceylon-Kona, English-Parrot

tree French-Acacia lebeck, Bois noir AL is found through out India, ascending to 13000 m. in the Himalayas[2]. It is widely available plant in the tropical and subtropical Asia and Africa with economic importance for industrial medicinal uses. AL is a leguminous plant belonging to the family Fabaceae (Formerly Leguminosae), member of the subfamily Mimosae. AL is large deciduous tree with grayish bark; young shoots glabrous. Leaves are evenly 2-pinnate and the leaflets are in 5-9 pairs, 2.5-5.0 cm long, broadly oblong and pale green, unequal sided, very obtuse glabrous above and reticulately veined beneath. Flowers are stalked, white fragrant in globose umbellate heads 2-3.8cm diameter. Peduncles 3.8-7.5cm long solitary or 2-4 together from the axils of the upper leaves. Calyx 4 mm. long teeth short, Corolla 1 cm long; tube glabrous; lobes 2.5 mm long. Stamens much longer than the corolla. Pod is 10-30 cm long and 2.5-5.0 cm broad, flat straw coloured and contains 4-12 pale brown seeds.

Flowering & fruiting periods are April to June.

PHYTO-CHEMICAL STUDY

Part of AL	Composition	Reference
Flower	Various sterols(Taxerol, cycloartemol, lupeol, campesterol, sitosterol)	Asif et. al.(1986)
Leaf	Pipelicand derivatives	Romeo(1984)
Root	Echinocystic acid(saponin)	Sotelo et al.(1986), Srivastava and Saxena (1988)

Two new tri-*O*-glycoside flavonols: kaempferol and quercetin 3-*O*- α -rhamnopyranosyl (1' 6)- β -glucopyranosyl(1' 6)- β -galactopyranosides, were identified from the leaves of Albizia lebeck[3].

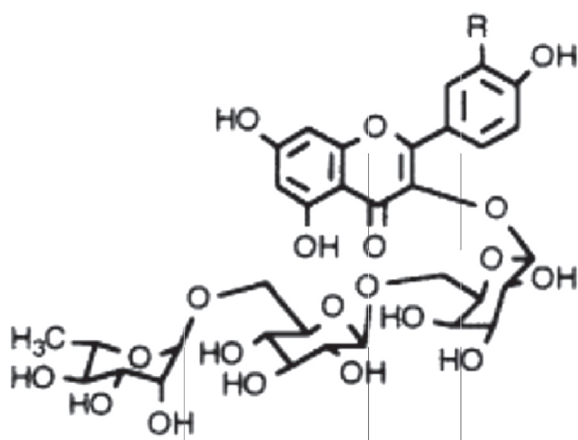


FIG. 1

Pod of the A. l. contains 3',5 dihydroxy4',7 dimethoxy flavone and N-benzoyl L Phenyl alaninol[4].The beans of the plants contain albiginc acid- a new triterpenoid sapogenin[5](Barua & Raman1959). The plant also contains saponins[6] (Pal et al. 1995; Ueda et al.2003) Macrocylic alkaloids[7] (Mishra et al. 1995; Dixit & Mishra, 1997) Phenolic glycosides[8] (Maa et al. 1997) and Flavonols[9] (El-Mousallamy 1998)

Table 1 : Chemical analysis of seed

Component	Value (% composition)
Moisture	4.55 \pm 0.04
Crude protein	38.04 \pm 0.40
Crude lipid	5.66 \pm 0.12
Crude fiber	11.63 \pm 0.21
Ash content	7.84 \pm 0.06
Nitrogen free extract	32.2 \pm 0.03

Low moisture content makes the shelf life for the seed long. Low lipid content is a favorable factor in preventing in rancidity of seeds stored for long periods .The ash contents (7.84%)of this seed is higher than that of other legumes which has been reported to range between3.0-4.8%(Elegbede1998), an indication that it may possess a higher mineral content .

PHARMACOLOGICAL ACTIVITY

Saponins are glycosides components often referred to as 'natural detergent' because of their foamy nature[12]. It has been established that saponins have anti -carcinogenic activity, immune modulation activities and regulation of cell proliferation as well as health benefits such as cholesterol lowering capacity. The toxic effect of cyanogenic glycoside decreases heart rate, decreases sympathetic activity & decreases systemic vascular resistance (Seiglar 1998).However for the AL seeds it is low. Tannin reduces protein solubility by forming a complex with protein, thereby causing a reduction I digestibility & causing depressed growth (Siglar 1998). The level of Tannin in the seed is negligible (Ahn et.al.1989). All these things mentioned above are the favorable condition for animal supplement diet. Therefore AL has a potential to be utilized as a cheap source of

Table2: Phytochemical screening of Albizia lebeck seeds[10]

Phytochemical components	Result
Cyanogenic glycosides (mg g ⁻¹)	0.11
Phytic acid (mg g ⁻¹)	0.25
Oxalate (mg g ⁻¹)	2.80
Saponin (%)	18
Tanin (mg g ⁻¹)	0.002

Table 3 : Analytical specification of dry stem bark [11]

PHYSIO-CHEMICAL ANALYSIS	
Loss on drying (%w/w)	<7.0
Ash content (%w/w)	<12.0
Acid insoluble ash (%w/w)	<2.0
Total soluble solid (%w/w)	>85.0
pH of 5%w/v solution	4.0-7.0
HEAVY METAL ANALYSIS	
Lead	<10ppm
Arsenic	<2
Cadmium	<1
Mercury	<0.1
PHYTO-CHEMICAL ANALYSIS	
Total polyphenols(%w/w)	≥20.0

protein, energy, & mineral supplement for animals. The alkaloids from the seeds of AL are fungicidal and cytotoxic to selected lines of cancer cells growing *in vitro* (Rahman et.al. 1986)

USES IN CLASSICAL TEXTS

AL are general and universal antidote (*Sirishah vishaghnanam shreshthah-Charak sutra*25/40). Its bark is used as ointment/lepa in skin diseases, erysipelas. All parts of the plants are recommended for the treatment of snake bite. Panchshirish Agad, a

preparation of 5 parts of this is recommended for the treatment of all type of poisoning. Amritaghrita, Gandhhasti agad, Mahagandhahasti agad are some other common preparation of AL which was used in different type of poisoning. (Charak Samhita). A.I. root is used in hemicranias in the form of nasya. It is also prescribed as antihelminthic and rat bite. The leaves are good for ophthalmic diseases. (Susruta Samhita). The root is astringent and prescribed for ophthalmia. The bark is antihelminthic, relieves toothache, and strengthens the gums and the teeth; used in leprosy, deafness, boils, scabies, syphilis, paralysis & weakness. The leaves are good in night blindness. The flowers are aphrodisiac emollient, maturant; their smell is useful in hemicranias. The seeds are aphrodisiac, brain tonic, used for gonorrhea and tuberculous glands; the oil is applied topically in leucoderma (Yunani)[13]. Traditional uses-In Indo-China the bark and the seeds are considered astringent, they are prescribed for diarrhea, dysentery and piles. In Madagascar the leaves are given as cure for syphilis. The plant is considered the most potent alexipharmic and every part of it is prescribed for the treatment of bites and stings from venomous animals. No part of the plant has antidotal value against either snake (Mhasker & Caius) or scorpion (Mhasker & Caius). Besides of this, it is grown as fodder for camels, water buffalo and cattle in India and other countries. In Sudan, goats eat the fallen leaves and flowers. The leaves are reported to be good fodder with 17-26% crude protein; 100 kg of leaves yield 11-12 kg of digestible protein and 37 kg of digestible carbohydrate. It has been reported that rabbits and bats feed on the leaves also[14]. The leaves of AL are remarkably free of toxins and tannins and are



Albizia lebbek (Twig with pod)



low in phenolic compounds. In the area of apiculture its flowers are fragrant and so attract bees. It is highly regarded by bee keepers for the light colored honey its nectar provides[15]. AL is a nitrogen fixing woody legume. The amount of nitrogen fixed increases with the age of the plant[16]. In addition, the nitrogen rich leaves are valuable as mulch & manure.

Anti asthmatic activity

Asthma is now recognized to be a primarily inflammatory condition; inflammation underlying hyperactivity. AL has been shown to possess anti asthmatic activity. Clinical trials with the bark have showed significant relief in case of bronchial asthma. In an experiment, the bark decoction in dose of .25g to .1.0 g/kg significantly protected the guinea pig (300-400g of either sex) against 1% histamine induced bronchospasm. The action started within 1 hr of drug administration and the protection was maximum with a dose of 1g per kg ($p < 0.025$). The decoction of the flower in the dose of 50mg/kg significantly protected the guinea pig against histamine induced bronchospasm. Now it has been established that both the bark and flower decoction of the plant protect the guinea pig against Histamine induced bronchospasm and it could be due to smooth muscle relaxation[17]. In another experiment on rat mesenteric mast cells, 12 albino rat of either sex (100-150g) were treated with 0.5g/kg of bark orally for one week, 8 control animals were treated with equal volume of distilled water. On the seventh day the animals of both the groups were sacrificed, intestine removed & kept in ringer-lactose solution. Mesenteric mast cells per high power microscopic field were counted. Ten such fields were counted with each rat. In the other group of similar study mesentery was incubated with 2.5 micro g/ml of compound 48/80[18] for ten minutes at 37° C and percentage of mast cell disrupted was recorded. The mean mesenteric mast cell count in the control albino rat was 9.3 ± 0.84 per field while in the bark treated group it was 11.1 ± 0.42 per field. It appeared that the numbers of mast cells following the drug treatment was more than normal but the difference was statistically insignificant. The drug significantly reduced the rate of the disruption of the mast cells by antigen in sensitized rats. It thus appears that the drug inhibits the phenomenon of sensitization.

There was no difference in the normally disrupted mast cells counts in the control (5.0 ± 1.1) and the bark

decoction treated group (5.3 ± 2.2). But when the mesentery of the control sensitized animals was challenged with the antigen (horse serum), $69.6 \pm 9.5\%$ of the mast cells were disrupted. Similarly when the mesentery of the bark treated sensitized animals was challenged with the antigen, $27.4 \pm 11.4\%$ of the mast cells were disrupted. The disruption of the mast cells with antigen was significantly lower in rats which were pretreated with bark decoction ($p < 0.025$)

Effect on anaphylactic shock-It has been proved in guinea pig sensitized with horse serum that the bark decoction significantly protected anaphylactic shock ($p < 0.025$) but it is neither mediated through the stability of the mast cell nor through the adrenal gland. Studies on sensitized Albino rat suggest that the anti-anaphylactic activity could be due to the inhibition of phenomenon of sensitization[19]. Hot aqueous extract of AL bark was not found to possess anti allergic properties in experiment model of cutaneous anaphylaxis and mast cell stabilization activity. Hot aqueous extract of stem bark did not possess any bronchodilatory effect *per se* in non sensitized animals[20]. The decoction of the bark had a significant cromoglycate like action on the mast cells of albino rats and appeared to also inhibit the early process of sensitization and synthesis of reaginic type of humoral antibodies. The studies indicated that the antianaphylactic activity of the plant besides being due to cromoglycate action on the mast cells, is also due to inhibition of the synthesis antibodies and suppression of T-lymphocytes activity[21,22]. The crude extract of the seeds and a pure saponin fraction at a dose of 0.5 mg/ml had a stabilizing effect on the mast cells in the mesentery and peritoneal fluid of rats subjected to anaphylaxis[23]

Effect on adrenal gland thymus and spleen of albino rats: The effect of 7 days treatment with the bark decoction produced insignificant reduction in the weight of adrenal, thymus & spleen ($p > 0.05$). Consequently it was established that the anti asthmatic and the anti anaphylactic action of the drug are not mediated through adrenal gland. The drug however, significantly reduced the cholesterol content ($p < 0.05$) but the ascorbic acid content of the adrenal gland were hardly changed ($p > 0.05$).

Pulmonary eosinophilia: In a preliminary screening 35 cases of tropical pulmonary eosinophilia were

treated with shirish flower for 6 week. The dose 200mg twice a day with water. The result indicated that 82% cases showed excellent response, 12% showed good response whereas 6% showed poor response. No side effects were observed[24].

Allergic conjunctivitis : In a clinical study the role of 29% of ghanasatva of AL bark and 500 mg capsule of AL showed very favorable response in all kinds of allergic conjunctivitis[25].

Effect on reproductive system : Methanolic pod extract of LA feeding causes anti spermatogenic effect evidenced by reduction in spermatocyte & spermatogonia count, reduction in sperm density & sperm motility and decreased size of testes, epididymis, and seminal vesicle and prostate in male rats[26]. In an experiment, oral administration of saponin isolated from A. lebbek bark at the dose level of 50mg/kg bw per day for 60day to male rats brought about a significant decrease in weight of testes, epididymis, seminal vesicle & ventral prostate. The production of round spermatid was reduced by 73.04% A.lebbek treated rats. The population of preleptotene spermatocytes & spermatogonia were reduced by 65.07% & 47.48% and secondary spermatocytes by 73.4% respectively. Sperm motility as well as sperm density was reduced significantly. A. lebbek reduced the fertility of male rats by 100%. There were no significance changes in RBC & WBC count, Hb, hematocrit & glucose in blood & cholesterol, protein, triglycerides & phospholipids in the serum. The protein, glycogen & cholesterol contents of the testes, fructose in the seminal vesicles & protein in epididymis were significantly reduced. Highly reduced seminiferous tubular diameter & increased intra tubular space were also observed when compared to control[27]. The total saponins obtained from the seeds when given at oral dose of 200 mg/kg for 2d, inhibited copper-induced ovulation in 60% of rabbits and caused marked reduction in average number of bleeding points in the ovaries[28]. The ethanolic extract of the pods and root at a concentration of 2% as well as the saponin lebbekanin-E exhibited spermicidal activity in rat and human semen[29,30,31].

Diuretic effect : The saponin isolated from the seeds at a dose of 200mg/kg orally did not exhibit diuretic activity in albino rats[32].

Anti-diarrheal activity : AL possesses anti bacterial activity against infectious diarrhea. Aqueous, methanol & chloroform extracts of AL exhibited activity against E. coli & Salmonella species. Petroleum ether & hexane extracts did not exhibit any activity. None of the extracts showed activity against Shigella & Candida sp[33]. It has also been shown that AL has moderate activity against V. cholerae, A. hydrophilis and B. subtilis[34].

Antimicrobial activity : The total glycosides, cardenolide glycosides, anthraquinone glycosides isolated from the stem bark revealed antimicrobial activity against the test cultures of Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans, Trichophyton rubrum, T. tonsurans, T. violaceum, T. mentagrophytes. The mechanism of action of the active principles was studied. The glycosides caused leakage of cytoplasmic constituents[35]. The extract of the root showed antifungal activity against the plant fungi *Helminthosporium sativum*[36]. The alcoholic extract of the bark revealed moderate anthelmintic activity against in vitro human ascaris lumbricoides[37].

Analgesic & anti-inflammatory activity-Inflammation is considered as a primary physiologic defense mechanism that helps the body to protect itself against infection, toxic chemicals, allergens or other noxious stimuli. In an experiment petroleum ether, ethyl acetate, methanol extract of AL bark was prepared. In rat paw edema model induced by carrageenan the extract at the 400mg/kg BW doses level was given and 36.68% ($p < 0.001$) inhibition of edema volume at the end of 4 hr was observed[38]. The carrageenan induced rat paw edema is a biphasic process [39]. The release of histamine or serotonin occurs in the first phase & the second phase is associated with the production of bradykinin, protease, prostaglandin & lysosome [40]. Therefore the inhibition of carrageenan induced inflammation could be due to the inhibition of the enzyme cyclooxygenase & subsequent inhibition of prostaglandin synthesis. The peripheral analgesic activity of the extract of AL was measured by the acetic acid induced writhing test. The bark extract of AL at the 400mg/kg BW doses level showed significant ($p < 0.001$) reduction in the number of writhes with 52.4 % of inhibition[41]. The constriction response of abdomen produced by acetic acid is a sensitive procedure for peripheral analgesic agent. This

response is believed to be mediated the prostaglandin pathway[42]. The central analgesic activity of the plant material was studied by measuring the drug induced changes in the sensitivity of the pre screened (Reaction time 2-4 sec) mice to heat stress applied to their tails by using a medicraft Analgesiometer-N(D'Amour and Smith 1941). In this connection the radiant heat tail-flick test was performed. The crude extract produced 61.48%($p < 0.001$) elongation of tail flicking time 30 min after oral dose of 400mg/kg Bw. In this test the plant extract prolonged the stress tolerance capacity of the mice, indicating the possible involvement of higher centres [43]. The bark administered in a dose of 250mg/kg i.p. showed analgesic activity being less than that of novalgin[44]. Aller-7, a botanical formulation of AL along with 6 other plants (*Phyllanthus emblica*, *Terminalia chebula*, *T. bellerica*, *Piper nigrum*, *Zingiber officinale*, and *P. longum*) exhibits potent activity against different inflammatory response because of mast cell stabilization, lipoxigenase inhibition, hyaluronidase inhibition in number of in vitro models tested[45].

Nootropic and Anxiolytic Activity

The effect of saponin containing *n*-butanolic fraction (BF) extracted from dried leaves of *Albizia lebeck* was studied on cognitive behavior and anxiety in albino mice. The studies showed that BF possesses anxiolytic activity and nootropic activity[45]. BF inhibited baclofen-induced hypothermia and passivity. Thus the study suggests that saponins act by modifying GABA ergic mechanism.

The effect of saponin containing *n*-butanolic fraction (BF) extracted from dried leaves of *Albizia lebeck* on learning and memory was studied in albino mice using passive shock avoidance paradigm and the elevated plus maze. Significant improvement was observed in the retention ability of the normal and amnesic mice as compared to their respective controls. The effects of BF on the behavior influenced by serotonin (5-HT), noradrenaline and dopamine have been studied. The brain levels of serotonin, gamma-aminobutyric acid (GABA) and dopamine were also estimated to correlate the behavior with neurotransmitter levels. The brain concentrations of GABA and dopamine were decreased, whereas the 5-HT level was increased[46]. The data indicate the

involvement of monoamine neurotransmitters in the nootropic action of BF of *A. lebeck*.

CONCLUSION

In last two to three decades, it has been observed that number of phytochemical, pharmacological study are being performed to find out the different therapeutic properties of a herbal medicines. All the therapeutic properties mentioned in Ayurvedic and other classical medicines are being tested and if they are found correct they are accepted otherwise discarded. Antidotal value of shirish is not found correct. Beside this, there is other therapeutic properties present in AL like anti anaphylactic, anti-asthmatic, anti-diarrheal, anti-spermatogenic, anxiolytic activity etc. However most of the therapeutic properties are proved in animal experiment model, there fore it is very necessary to conduct controlled clinical studies so that more clinical data in support of effectiveness of medicine can be collected.

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