



Review Paper

Bark of Acacia Arabica – A Nature's Gift: An Overview

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Abstract

Acacia arabica is a popular ornamental avenue tree. In India, commonly known as babool, used in Indian System of Medicine for the prevention and treatment of various health ailments, has been in practice for hundreds of years. Bark of *Acacia arabica* has been reported to be effective in various diseases. The concentration of Tannin in bark varies considerably from 12-20%. Several polyphenolic compounds have been found out in bark. Phytochemical screenings of the stem bark reveals that it contains terpenoids, alkaloids, saponins and glycosides. This article briefly reviews the ethanobotanical as well as medicinal uses of bark of *Acacia arabica* with plant description. This is an attempt to compile and document information on different aspect of *Acacia arabica* and its potential uses. More studies are needed before the pharmacological properties of *Acacia arabica* can be utilized in therapy.

Keywords: Bark, Indian system of medicine, phyto-chemical studies, scientific reports.

Introduction

It is a bark of tree belongs to family Leguminosae and is known as Babul or Babur in Hindi, Kikar in Punjabi¹. Ancient Greeks were well known to this tree in 300 BC. This is also clear with this fact that Theophrastus, whose period is 370 BC, mentioned about the gum of this tree by the name 'kami'. The English word is derived from the same word 'kami'. Now a day it is known as Gum Arabic, this name was popular during the period, when it was imported in Arab in huge amount. Some authors mentioned that ancient Indians were also aware with this drug. However, according to Dr. Awade Chandradat that gum *Acacia* was not mentioned in Sanskrit literature². According to the literature, this is a famous tree is of two important types. Characteristics of one tree, which is known as black consists fewer spines, many branches, trunk is black, wide and large. Characteristics of second tree which is known as brown have more spines than black one and its trunk is brownish black. Heights of both the trees are 50-60 feet high which is usually not straight is 10-15 feet high. Circumference of its trunk is 5-6 feet to 10-12 feet. Branches are wide spread, bark is thick and having small continuous fissures. Spines are shiny and white in colour. The leaves of *Acacia* are similar to the leaves of tamarind. Flowers are yellow in colour, round and spherical in shape. Flowers bloom in sawan (July-August). Their pod comes in the month of phaagun (February–March). Pods have 9-20 seeds. In between pod and seeds there is a thin white film. Every seed is small, flat and broad in shape. In the beginning seeds are green and on dry they become black. Pod contains a yellowish sticky fluid. Gum oozes from the trunk in the month of chait (March-April) and it is white and red in colour².

Vernacular names: Arabic: Ummughilan^{2,3,4}, Talah, Samar², English: Indian Gum Arabic tree, Babul tree^{5,6}, Hindi: Babul, Kikar^{5,7,8,9}, Persian: Kar-e-Mugilan; Mugilan^{10,11}, Sanskrit: Ajabaksha, Dirghakantaka, Goshringa^{3,8}, Unani: Aqaqia, Babul, Kikar, Mughilaan, Samar⁶, Urdu: Babul⁶

Habitat and Distribution

The Babul tree is a strong light demander but is susceptible to frost. The greatest plus point is that it tolerates even insensitive droughts. It is a tree of miraculous adaptations. As its adaptation is very wide, this tree is distributed widely in India under different climatic conditions. It seldom extends above 500 m in altitude. It grows well in dry, hot arid climates with high mean maximum temperature regime (upto 50⁰C) and very low minimum temperature (even below 0⁰C) that is, even in deserts. The rainfall requirement ranges from 100 mm to 1000 mm. Babul is known for its endurance to very long hard summer seasons and in water logged areas. It can come up in saline or brackish water too. The long taproot is an adaptation to absorb water from depths and Kankrilli layers. It is called as a "Phreatophyte" meaning a plant, which is able to scavenge water from deeper soil layers. It tolerates salinity; pH is of range from 7.5 to 8.5. It can also come up in shallow soils and rocky areas. It is not a good coppice and root suckers are absent in the species.

Babool is seen all over the Indian subcontinent to an altitude of up to 3000 meter. It is called Indian gum-Arabic tree. It is found very common in the forest fringes in Madhya Pradesh, Chhattisgarh, Jharkhand, and Uttar Pradesh, Rajasthan, Maharashtra and other dried parts of country. The tree is also

distributed in Burma, Sri Lanka, and Bangladesh. Babul tree is more common in western states of the peninsula. It is native to North Africa, it is commonly found in Egypt¹.

Botanical Description

It is a medium-sized, evergreen tree with a short trunk and having round spreading crown with feathery foliage, found in the whole drier parts of India. It normally attains a height of 15 m and having girth of 1.2 m, although trees reach up to a height of 30 m with a girth of 3 m have also been reported. Bark is a rough dark brownish to nearly black in colour with longitudinally and deeply cracked fissured. Leaves are from 2.5-5 cm long, bipinnate with spinescent stipules, pinnules narrowly oblong. It produces golden yellow flowers with fragrant, crowded in long-stalked globose heads. Pods are flat shaped, 7.5-15.0 cm, contracted between the circular seeds^{3,12}. Flowers bloom from June to September, and also in December to January. The fruits are stalked and compressed moniliform pods with constriction in between seeds. There may be 8-12 seeds per pod. Pods ripen in the months of May to June¹.

Phyto-Chemical Studies

The concentration of Tannin in a bark varies considerably from 12-20%. Several polyphenolic compounds have also been reported in a bark⁶. Phytochemical screening of the stem bark reveals that it contains terpenoids, alkaloids, saponins and glycosides.

During experiments it was proved that the absence of steroids and flavonoids were recorded. But it have a variety of phytochemical such as gallic acid, ellagic acid, isoquercetin, leucocyanadin, kaempferol-7- diglucoside, glucopyranoside, rutin, derivatives of (+)-catechin-5-gallate, apigenin- 6,8-bis-C-glucopyranoside, m-catechol and their derivatives. It contains gallic acid, m-digallic acid, (+)-catechin, chlorogenic acid, gallolyated flavan-3, 4-diol, robidandiol (7, 3, 4, 5-tetrahydroxyflavan-3-4-diol), androstene steroid, D-pinitol carbohydrate and catechin-5-galloyl ester. The bark is rich in phenolics viz. condensed tannin and phlobatannin, gallic acid, protocatechuic acid pyrocatechol, (+)- catechin, (-) epigallocatechin-7-gallate, and (-) epigallocatechin-5,7-digallate.

The bark is also reported to contain (-) epicatechin, (+) dicatechin, quercetin, gallic acid, (+) leucocyanidin gallate, sucrose and (+) catechin-5-gallate. As medicinal plant from which the two polyphenolic compounds like kaempferol and umbelliferone has been reported for the first time¹³. T1 (Butanol solubles) and T2 (Butanol insolubles) polymeric tan fractions, both are mostly responsible for the tanning potency of babul liquor and have to some extent good affinity towards hide powder. Due to it's lower molecular weight of polyphenols of the bark mainly responsible for fungitoxic activity¹².

Pharmacological actions

Astringent^{3,4,5,7,11,14,15} Gum Tonic^{2,5,16} Acrid^{3,16} Resolvent^{5,10}
Demulcent^{4,15} Emetic^{3,19} Anthelmintic^{3,6} Antibacterial^{3,6}
Antifungal¹⁷.

Medicinal use: Odontalgia^{8,14} Stomatitis^{5,19} Sore Throat^{5,8,10,18,14,16} Cough^{2,5,6,18} Leucorrhoea^{5,18,20} Syphilis^{2,5}
Leprosy^{2,5} Gonorrhoea^{4,5,10} Diarrhoea^{3,6,9,10,18} Piles^{3,4,6,9,18}
Vaginitis^{4,5} Prolapse of Uterus^{4,5} Prolapse of Ani^{4,5} Ascitis³
Cystitis^{4,5,19} Spermatorrhoea^{9,16}

Scientific Reports

Antiplatelet Aggregatory Activity: A study was carried out by Bukhtiar H. Shah et al that the extract of *Acacia nilotica* (*A. nilotica*) have capacity to blocked platelet aggregation mediated by platelet agonists, arachidonic acid (0.75 μ M), ADP (4.3 μ M), platelet activating factor (800 nM) and collagen (638 nM) in a dose-dependent manner. The findings revealed that the antiplatelet aggregatory activity of the extract of *A. nilotica* is mainly due to blockade of Ca²⁺ channels, although evidence also suggests that the involvement of protein kinase²¹.

Antibacterial and Antifungal Activities: A study was carried out to confirm the antimicrobial activity. The results of study revealed that the extracts of stem bark have the antimicrobial property against *Streptococcus viridans*, *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis* and *Shigella sonnei* using the agar diffusion method. *A. nilotica* (*A.arabica*) could be a potential source of antimicrobial agents²⁴. In another study in which Kalaivani and Methew reported that *A. nilotica* (*A.arabica*) demonstrates highest activity against three bacterial (*E. coli*, *S. aureus* and *Salmonella typhi*) and two fungal strain (*Candida albicans* and *Aspergillus niger*)²³.

Anti-Hypertensive and Anti-Spasmodic Activities: Gilani et al reported that on using of methanolic extract of *A. nilotica* (*A.acacia*) reduces the arterial blood pressure and provides evidence of antihypertensive activities independent of muscarinic receptor stimulation²⁴. An aqueous extract of *A. nilotica*(*A.arabica*) was also observed that it have sustained dose-related contractile activity on the isolated guinea-pig ileum. Intravenous administration of the extract produced a dose-related significant elevation of blood pressure²⁵.

Acetylcholinesterase Inhibitory Activities: A study was carried out by Crowch and Okello that acetylcholinesterase is the treatment of Alzheimer's disease. It was observed that *A. nilotica* (*A.arabica*) have to potent Acetylcholinesterase inhibitory activities due to effect on central nervous system. More investigations are to be needed in the treatment of Alzheimer's²⁶.

Hypoglycemic Activity: A study was carried to found out the hypoglycaemic effect of aqueous extract (hot and cold water)

and hydroalcoholic extract of *Acacia arabica* by M.D.Kharya et al. Oral administration of cold water extract of *Acacia arabica* bark to diabetic and normal rats at a dose of 400 mg/kg body weight resulted in significant reduction of blood glucose, cholesterol and triglycerides. Phytochemical investigations found that phenolic compounds are presents in *Acacia arabica* extracts. The cold water extract of *Acacia arabica* was found to reduce blood glucose level to its normal level within seven days. Histological studies of the β -cells show its action on pancreas²⁷.

Antioxidant Activity: Scavenging activity of the bark powder extract in various solvents using maceration process was reported by Del WE²⁸.

Another study was carried out by Kalaivani T and Mathew L. They found that *A. nilotica* (*A.arabica*) is easily accessible source of natural antioxidants, which can be used as a supplement to facilitate in the therapy of free radical mediated diseases such as cancer, diabetes, inflammation, etc. Furthermore, the high scavenging property of *A. nilotica* (*A.arabica*) may be due to hydroxyl groups existing in the phenolic compounds that can scavenge the free radicals²³.

Antiviral Activity: Rehman et al reported that the antiviral activity of *Acacia nilotica* (*A.arabica*) against Hepatitis C Virus in liver infected cells. The results explain that acetonic and methanolic extract of *Acacia arabica* (AN) showed more than 50% reduction in non toxic concentration²⁹.

Therapeutic Activity in Trypanosomiasis: A study was carried out to confirm that bark have therapeutic effects in Trypanosomiasis. The findings of the study revealed that methanol extract of stem bark assures the therapeutic effects in Trypanosomiasis. LD 50 of the partially purified extract was found to be 2000mg/kg body weight and the extract being acutely toxic at a dose of 1600mg/kg body weight. It was also concluded at the study that methanol extract of stem bark of *A.nilotica* cures experimental *T.b brucei* infection in mice³¹.

Antiplasmodial Activities: El-tahir et al reported that the ethyl acetate extracts is having the highest activity on *Plasmodium falciparum*³¹ and Jigram et al revealed that the crude methanolic root extracts of *A. nilotica* (*A. arabica*) have significant effect against chloroquine sensitive strain of *Plasmodium berghei* in mice³².

Gastroprotective Activity: Vijay Kumar Bansal and Rajesh Kumar Goel reported the antiulcer potential of *Acacia nilotica* in different ulcer models in rats. They concluded that the hydroethanolic extract of young seedless pods of *Acacia nilotica* has antiulcer activity in pylorus ligation, swimming stress and NSAID induced rat ulcer models. The extract containing more amount of phenolic components show high antiulcer activity, indicating the phenolic component of the extract to be responsible for the activity of the extracts³³.



Figure-1
Acacia arabica Tree



Figure-2
Laboratory Sample of Bark of *Acacia arabica*

Conclusion

The information collected above on the uses of bark of *Acacia arabica* across the globe having similarity with available literature. In the last few years, ethno-botanical and traditional applications of natural compounds, especially of herbal origin received most of the attention as they are well tested for their efficacy and generally believed to be safe and effective for human life.

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