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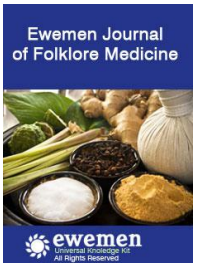

Review

ALTERNATIVE THERAPIES OF BABUL IN MEDICINE AND DENTISTRY: A REVIEW

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ABSTRACT

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Abstract

Advances in the field of alternative medicine have promoted the use of various natural products. Babul (*Acacia arabica*) is such product which has innumerable benefits in the field of medicine which has procured appreciable importance in clinical research. *Acacia arabica* has been reported to be effective against a medley of disease. The fresh plants parts of *Acacia arabica* is considered with good nutritional value in Indian traditional medicine system. This article briefly reviews the medicinal as well as dental uses of *Acacia arabica* with plant description. This is an attempt to collate and document information on different aspect of *Acacia arabica* and its potential use.

Keywords: Alternative therapy, Dentistry, Babul, *Acacia Arabica*

INTRODUCTION

Name of the Medicinal Plant is *Acacia arabica (L.).* Synonyms are *Acacia nilotica* (Lam.) Willd., *Acacia scorpioides* W. Wight, *Mimosa arabica* Lam., *Mimosa nilotica* L., *Mimosa scorpioides* L. Belongs to a Family/tribe: Fabaceae (alt. Leguminosae). Common names are Acacia gomifera, babul, babul acacia, gum arabic tree, Indian, gum arabic tree, thorny acacia. Regional names in English are Babul, Black Babul, Indian Gum Arabic tree and in Hind are Babul, Kikar (Rajvaidhya *et al.*, 2012).

Acacia was first described by Linnaeus in 1773. It is estimated that there are roughly 1380 species of *Acacia* worldwide, about two-third of them native to Australia and rest of spread around tropical and subtropical regions of the world (Maslin *et al.*, 2003).

In Australia it is regarded as one of the worst weeds because of its invasiveness, potential for spread, and economic and environmental impacts. It is widely distributed throughout arid and semi-arid zones of the world. Presently about 20% of the total geographical area of India is wasteland. Growing demand for fuel, fodder, wood and food has extensively depleted or eliminated protective plant cover and exposed soils to processes of degradation resulting in partial to complete loss of soil productivity. Since nitrogen is generally deficient in such lands, there is a great need for the identification of suitable nitrogen fixing plants; those can thrive well during the process of stabilization and recovery of degraded sites. In such conditions *A. arabica* can play an important role. It is a relatively fast growing, drought resistant multipurpose legume

with the ability of biological nitrogen fixation (Bargali and Bargali, 2009). In addition, its strong tap root system (Toky and Bisht, 1992), long growing period of more than 300 days with four peaks of leaf flush it can intensively exploit soil column for nutrients and moisture. This species has high potential for nitrogen fixation (Toky *et al.,* 1994), and has been considered as one of the fast growing species of the wastelands, and agro forestry systems throughout India providing strong timber, fodder for goats and sheep, and high quality fuel wood apart from enriching the soil with nitrogen. In the present article information on various aspects of *A. arabica* and its role in recovery of wastelands/degraded lands was reviewed (Bargali and Bargali, 2009).

Perennial shrub or tree, 2.5 to 10 (sometimes 20) m tall, variable in many aspects. Branches spreading, forming a dense flat or rounded crown with dark to black coloured stems; branchlets purple-brown, shortly or densely pubescent, with lenticels. Bark thin, rough, fissured, deep red-brown. Spines (thorns) thin, straight, light-grey in axillary pairs, usually in 3–12 pairs, 5–7.5 cm long in young trees, mature trees commonly without thorns. Leaves bipinnate 30–40 mm long, often with 1–2 petiolar glands and other glands between all or only the uppermost pinnae; pinnae 2–11 (–17) pairs, with 7–25 pairs of leaflets (1.5–7 mm long) per pinnae (Rajvaidhya *et al.*, 2012).

MATERIALS AND METHODS

This review was conducted on the basis of articles search from SGT University library and also from electronic database and internet search engine such as pubmed and google scholar. About 20 publications from different journals were reviewed, from among which 18 publications were selected for review. This review article was prepared to provide the readers scientifically robust and technically sound research information on babul (*Acacia arabica*).

RESULTS AND DISCUSSION

Chemical constituents

Acacia species contains secondary metabolites including amines and alkaloids, cyanogenic glycosides, cyclitols, fatty acids and seed oils, fluoroacetate, gums, nonprotein amino acids, terpenes (including essential oils, diterpenes, phytosterol and triterpene genins and saponins), hydrolyzable tannins, flavonoids and condensed tannins (Seigler, 2003). The plant is richer source of cystine, methionine, threonine, lysine, tryptophan, Potassium, phosphorus, magnesium, iron and manganese (Singh *et al.*, 2008). The plant chemical compounds like diester, pentacosane dioic acid dihexadecyl ester and is alcohol, heptacosan-1,2,3-triol (Banso, 2009).

Seeds: It contain high percentage of phenolic constituents consisting of m-digallic acid, gallic acid, protocatechuic and ellagic acids, leucocyanidin, m-digallic dimer 3,4,5,7-tetrahydroxyflavan-3-ol, oligomer 3,4,7-trihydroxyflavan-3,4-diol and 3,4,5,7-tetrahydroxyflavan-3-ol and (-)-epicatechol. The mature seed also contains crude protein, crude fibre, crude fat, carbohydrates, potassium, phosphorus, magnesium, iron and manganese occurred in high concentrations and it is richer source of cystine, methionine, threonine, lysine and tryptophan.

Fruit: The fruit also contains mucilage and saponins.

Pods: The pods contain gallic acid and its Me-este-n-digallic acid and condensed tannins.

Leaf: The leaf contains apigenin, 6-8-bis- D-glucoside, rutin, 8% digestive protein (12.4% crude protein). Relative levels of tannin in different parts of plant is, deseeded pods (50%), pods (5.4%), leaves (7.6%), bark (13.5%) and twigs (15.8%).

Bark: The stem bark contains tannin (12-20%), terpenoids, saponins and glycosides, Phlobetannin, gallic acid, protocatechuic acid pyrocatechol, (+)–catechin, (-)-epigallocatechin- 5,7-digallate. Its extract contains total phenolic content ranging from 9.2 to 16.5 g/100 g.

Root: It contains octaconsanol, betulin, B-amyrin and B-sitosterol. Gum: It is composed of galactoaraban which gives on hydrolysis L-arabinose, D-galactose, L-rhamnose, D-glucuronic acid and 4-O-methyl- D-glucuronic acid (Malviya *et al.*, 2011).

Medical implications

Antibacterial activity

Mahesh B *et al.* (2008) has observed antibacterial activity study of methanolic extracts of *Acacia arabica*, showed highest antibacterial activity against *B. subtilis.* and *Staphylococcus aureus* with inhibition zone

15±0.66mm and leaf extract showed highest activity against *Bacillus subtilis* with inhibition zone 20±1.20mm (Mahesh and Satish, 2008). In another study conducted by Saini ML and his colleagues examined comparative antimicrobial studies of *Acacia* species and *A. arabica* exhibited highest activity against three bacterial (*Escherichia coli*, *Staphylococcus aureus* and *Salmonella typhi*) and two fungal strain (*Candida albicans* and *Aspergillus niger*) (Saini *et al.*, 2008).

Antifungal activity and antiviral activity

Acacia arabica species can be regarded as promising resources for antibacterial drugs due to its highly active nature. Mahesh *et al.* (2008) demonstrated the antifungal activity of methanolic extracts and aqueous extracts of *A. arabica* with percentage inhibition ranging from 34.27± 1.45 to 93.35±1.99 (Mahesh and Satish, 2008). Dried fruits of *Acacia arabica* are active against *C. albicans* and used to treat oral candidiasis (Malviya *et al.*, 2011).

Antibiotic activity

The plant extract showed potent antibiotic activity against four bacterial species: gram positive; *Bacillus subtilis*, *Staphylococcus albus*, *Streptococcus faecalis*; gram negative, *Escherichia coli* and two fungal species: *Candida albicans* and *Aspergillus flavus* examine by using paper disc diffusion method (Shanab, 2007).

Anti-mutagenic activity

Gallic acid and polyphenols present in acetone extract of the plant are responsible for the antimutagenic activity. Acetone extract of *Acacia arabica* exhibited antimutagenic activity against direct acting mutagens (NPD, sodium azide), and the S9-dependent mutagen 2-aminofluorene (2AF). The activity is estimated by employing the plate incorporation Ames *Salmonella histidine* reversion assay by using different strains of *Salmonella typhimurium* (Malviya *et al.*, 2011).

Antihelmintic, analgesic and anti-inflammatory activity

In vitro methanolic extract of *Acacia arabica* fruit exhibit anthelmintic activity against Haemonchus contortus at LC_{50} = 512.86 and 194.98 µg/ml concentration by the adultmotility assay, the egg hatch test and the larval development assay (Bachaya *et al.*, 2009). The analgesic effect of *Acacia arabica* against control is examined against acetic acid induced pain in rat. The potent activity was exhibited by plant. It shows high percentages of analgesia at the two doses (150, 300mg/kg bw) of plant extracts used. The anti-inflammatory activity of *Acacia arabica* extract was tested using egg albumin induced paw oedema inflammation in rats It indicates the absence of paw oedema suppression and hence lack of anti-inflammatory activity. The extracts did not however suppress paw oedema (Ali *et al.*, 2010).

Spasmogenic activity and antispasmodial activity

The aqueous extract of seeds of *Acacia arabica* shows spasmogenic activity on the isolated guinea-pig ileum. The mechanism behind it may be increase in calcium influx that results in muscle spasm. *Acacia arabica* (methanolic extract) inhibited the spontaneous contraction of rabbit jejunum in a dose-dependent (0.1– 3.0 mg/mL) manner. It also inhibit K+-induced contractions, The mechanism behind it is calcium channel blockade that results in lowering of blood pressure effect (Malviya *et al.*, 2011).

Dental Implications

Acacia gum consists primarily of *arabica*, a complex mixture of calcium, magnesium and potassium salts of Arabic acid. It contains tannins which are reported to exhibit astringent, hemostatic and healing properties. It also contains cyanogenic glycosides in addition to several enzymes such as oxidases, peroxidases and pectinases, all of which have been shown to exhibit antimicrobial properties. The bark constituents of *Acacia* catechuit are used to treat stomatitis, gingival bleeding, improve appetite (Gazi , 1991).

P, gingivalis and *P. intermedia* are strongly implicated in the pathogenesis of chronic periodontitis (Moore, 1987) and the proteoiytic activity of *P. gingivalis* is recognised as a potential virulence facto (Slots and Genco 1984). The in vitro inhibitory action of acacia gum against these organisms and their enzymes is thus of possible clinical significance (Clark *et al.*, 1993).

CONCLUSION

In this review, we comprehensively compile the information regarding its taxonomy, constituents, properties like antibacterial, antifungal, antihelmintic,

analgesic and anti-inflammatory activity etc. Traditionally the plant used widely for the treatment of various medical and dental ailments, but scientifically few of them was screened out. Thus the scientific studies should be conducted to investigate the unexploited potential of *Acacia arabica*.

CONFLICT OF INTEREST

None declared.

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