Review Article

A Review of Pharmacological Activities of *Acacia nilotica* (Linn) willd W.S.R to Osteoporosis

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Abstract

Medicinal plants have been utilized for the treatment of diseases since creation of earth or before it; in traditional medicine, they still play an important role as effective and have natural origin. *Acacia nilotica* commonly known as babul belongs to the family Fabaceae and is widely distributed all over India, SriLanka, and Sudan; Egypt is the native country of this plant. Useful parts such as root, bark, leaves, flower, gum, pods, etc., are used in medicines. Different parts of the plant like leaves and fruit contain tannin; flower contains stearic acid, kaempferol-3-glucoside, isoquercetin, leucocyanidin; pod contains tannin, polyphenolic compounds, gum Contains arabic acid combined with calcium, magnesium and potassium.

In traditional medicine, it is used for bleeding diseases, prolapsed, leucorrhoea, antihypertensive, antispasmodic, antibacterial, antifungal, antioxidant activity, etc. The present review is an attempt to explore and comprehensively highlight use for osteoporosis, phytochemical properties and pharmacological uses of *A. nilotica* reported till date.

Keywords: *Acacia arabica; Acacia nilotica*, Pharmacological study, Tannin, Arabic acid, Uses

Introduction

More than 30% healthcare industry from all over the world relies on medicinal plants. In India, traditional system of medicine such as Ayurveda since ancient times is root of medicine. About 750 species are being utilized in Ayurveda system of medicine and in modern medicine around 30 species only.[1] Medicinal plants are playing continuously essential part of Indian system of medicine. *Acacia* genus belongs to shrubs and trees, subfamily Mimosoideae,[2,3] of the family Fabaceae (Leguminosae).[4,5] The species name is *nilotica/arebica/scorpioides. A. nilotica* known as babbula is the important tree of the dry parts of India. Almost all its parts like root, bark, leaves, flower, gum, pods, etc.,[9,13] are used in Ayurveda. *A. scorpioides* W. Wight, *Mimosa arabica* Lam., *Vachellia nilotica, Mimosa nilotica* L., and *Mimosa scorpioides* L [6] are synonyms.

Names in Different Languages

English: Indian gum arabic, Tomentose Babool, Black piquant, Black babul, Gum arabic, Egyptian mimosa, Egyptian thorn, Prickly acacia, Nile acacia, Scented thorn, Scented-pod acacia[7,12]; Arabic: Ummughilan,[12] Usarequrz,[11,13]; Persian: Kharemughilan[9,11,12]; Urdu: Babul, Kikar[9,12]; Hindi: Kikar[8,11,12]; Kannada: Jaali, Gobbli[2,8]; Tamil: Karuvelam[12]; Telugu: Nallatumma[8,12]; Sinhala: Babbulae[10]; Sanskrit: Yugmakanta (two spikes are seen together), Dridaruha (strong stem, branches), Sukshma patra (smal leaves), Mahaphala (pods resemble a chain), Kantaki (spikes), Sapeetaka, Peetapushpa (yellow colored flower), Kashayakaha (astringent in taste).

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Description

A. nilotica is a tree 5 to 20 m high with a thick spherical crown with spikes, usually black-colored stems and branches, grey-pinkish slash, fissured bark, exuding a reddish low-quality gum; variable in shape; bark on trunk rough, fissured, blackish, grey or brown; young branches almost glabrous to subtomentose. stipules spine scent, up to 8 cm long. Leaf often with 1–2 petiolar glands and others between all or only the topmost of the 2-11 pairs of pinnae; leaflets 7–25 pairs, c. 1.5–7 mm long, c. 0.5–1.5 mm wide, glabrous to pubescent. Inflorescence axillary pedunculate heads, 6–15 mm in diameter. Flowers bright yellow, involucel from near base to half way up the peduncle. Calyx 1–2 mm long, pubescent or subglabrous. Corolla 2.5–3.5 mm long, glabrous to more or less pubescent outside. Fruit very variable, indehiscent, straight or curved, glabrous to velvety, 4–22 cm long, c. 1.3–2.2 cm wide. Seed blackish brown, smooth, 7–9 mm long, 6–7 mm wide, subcircular, compressed, areole 6–7 mm long, 4.5–5 mm wide. The plant has straight, light, thin, grey spines in axillary pairs, usually in 3–12 pairs, 5–7.5 cm long in young trees, mature trees commonly without thorns. The leaves are bipinnate, with 3–6 pairs of pinnulae and 10–30 pairs of leaflets each, rachis with a gland at the bottom of the last pair of pinnulae. Flowers in globulous heads 1.2–1.5 cm in diameter of a bright golden-yellow color, axillary or whorly on peduncles 2–3 cm long located at the end of the branches. Pods are strongly constricted, white-grey, hairy and thick (baravker et al., 2008). *A. nilotica* is a pantropical and subtropical genus with species abundant throughout Asia, Australia, Africa and America. *A. nilotica* occurs naturally in reserved forests, wastelands and is imperative in traditional rural and agro-pastoral systems (Shittu, 2010). *A. nilotica* is an imperative multipurpose plant that has been used broadly for the treatment of various diseases (Singh et al., 2009b).

Table 1.Medicinal Uses of Different Parts of *A. nilotica*

Part used	Common uses	References
Root	Cancers and/or tumors (of ear, eye, or testicles), tuberculosis and indurations of liver and spleen.	(Kalaivani and Mathew, 2010)
Leaf	Chemoprventive, anti-mutagenic, anti-bacterial, anticancer, astringent, anti-microbial, diarrhea, aphrodisiac, dressing of ulcers, anti-inflammatory and Alzheimer's disease.	(Kalaivani and Mathew, 2010; Shittu, 2010; Kalaivani et al., 2010)
Gum	Astringent, emollient, liver tonic, antipyretic and anti-asthmatic.	(Baravkar et al., 2008)
Stem bark	Anti-bacterial, antioxidant, anti-mutagenic, cytotoxic, astringent, acrid cooling, styptic, emollient, anthelmintic, aphrodisiac, diuretic, expectorant, emetic, nutritive, in hemorrhage, wound ulcers, leprosy, leukoderma, small pox, skin diseases, biliousness, burning sensation, toothache, leukoderma, dysentery and seminal weakness, cold, bronchitis, diarrhea, dysentery, biliousness, bleeding piles and leukoderma.	(Agrawal et al., 2010; Del, 2009; Kalaivani and Mathew, 2010; Kaur et al., 2005; Singh et al., 2009; Singh et al., 2008a)
Seeds	Spasmogenic activity and anti-plasmodial activity.	(El-Tahir et al.,1999; Amos et al., 1999)
Pods (Fruit)	Anti-hypertensive and antispasmodic, anti-diarrheal, astringent, anti-fertility and against HIV-1 PR, inhibited HIV-1 induced cythopathogenicity, antiplatelet aggregatory activity and anti oxidant.	(Gilani et al., 1999; Asres et al., 2005; Shah et al., 1997; Singh et al., 2009)

Natural medicinal plants promote self-healing, good health and durability in Ayurvedic medicine practices and it is acknowledged that *A. nilotica* can provide nutrients and therapeutic ingredients to prevent, mitigate or treat many diseases or conditions).

Phytochemistry

Phytochemical screening of the stem bark of *A. nilotica* exposed that the plant contains terpenoids, alkaloids, saponins and glycosides. Negative results were recorded for steroids and flavonoids which authenticate the absence of these phytochemicals (Banso, 2009). This plant recommends a variety of phytochemical such as gallic acid, ellagic acid, isoquercitin, leucocyanadin, kaempferol-7-diglucoside, glucopyranoside, rutin, derivatives of (+)-catechin-5-gallate, apigenin-6,8-bis-C-glucopyranoside, m-catechol and their derivatives. *A. nilotica* contains gallic acid, m-digallic acid, (+)-catechin, chlorogenic acid, gallolyated flavan-3, 4-diol, robidandiol (7, 3, 4, 5-tetrahydroxyflavan-3-4-diol), and rostene steroid, D-pinitol carbohydrate and catechin-5-galloyl ester (Singh et al., 2009a). The bark is prosperous in phenolics, viz., condensed tannin and phlobatannin, gallic acid, protocatechuic acid pyrocatechol, (+)-catechin, (-) epigallocatechin-7-gallate, and (-) epigallocatechin-5,7-digallate (Singh et al., 2009a). The bark is also reported to contain (-) epicatechin, (+) dicatechin, quercetin, gallic acid (+), leucocyanidin gallate, sucrose and (+) catechin-5-gallate (Mitra and Sundaram, 2007). *A. nilotica* is a medicinal plant from which the polyphenolic compounds kaempferol has been reported for the first time]. Another compound umbelliferone has been reported from *A. nilotica* (Singh et al., 2010b)

Chemical Constituents

Bark and pods of *A. nilotica* contain 12–20% tannin, various polyphenolic compounds (dicatechin, quercetin, gallic acid[14,16] and∞ - amyrin, ß-sitosterol.[17,15] Galactose, aldobio uronic and arabinobioses are present in the gum resin. 52% calcium and 20% magnesium are also part of this gum resin. Flavonoids, kaempferol-3-glucoside, iso-quercitrin and leucocyanidin are reported in the flower.

Wood contain chlorides,[18] seeds contain moisture, crude protein, fat, N-free extract, crude fiber, calcium, phosphorous, iron, niacin, ascorbic acid, and thiamine. The essential amino acid composition of the seed protein is histidine, lysine, methionine, cystine, leucine, valine, and threonine and fruit also contain gallic acid.[17] Root contains hentriacontane, lapachol, n-hentriacontanol, sitosterol,[19] octacosanol, betulin, ß-amyrin.[16]

Ayurvedic Pharmacology of Babbula[20]

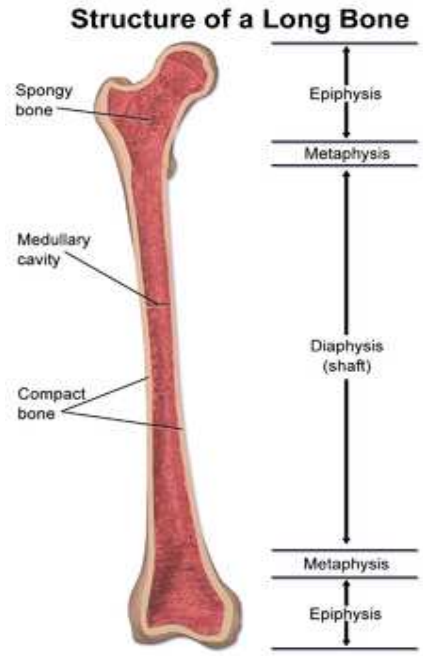
Babbula classically categorized as:

- Kaiyyadeva Nighantu-Oushadhi varga
- Shodhala Nighantu-Amradi varga
- Bhava Prakasha Nighantu_ vatadi varga

Rasa(Taste)	Guna(Qualities)	Virya(Active Principle)	Vipaka(Metabolism)	Karma (Action)
Kashaya (astringent)	Guru (heavy to digest) Rooksha (dry in nature)	Shita (coolant)	Katu (undergoes pungent taste after digestion)	• Kaphahara (balances kapha dosha) • Pittavahara (gum-balances pitta-vata doshas)

Effect on Doshas

It harmonizes the kapha, vata and pitta dosha so it can be used effectively in diseases of kapha, vata and pitta doshas origin. According to Ayurveda, bone, i.e., asthi (bone tissue) is the 5th dhatu in our body. Bone has panchabhautic constitution and it exhibits properties of prithvi mahabhuta more prominently. Asthi is one of the destinations of vayu (vata sthana). The vayu and asthi are inversely proportional to each other. that means when vayu increases in asthi, asthi decreases, and vice versa. Classical text recommended babbula for proper union of fractured bones and also for strengthening otherwise healthy bones. Babool bark decoction is recommended for gargling in mouth, teeth and throat problems also. It is used by traditional healers of different regions of Chattisgarh state in India in treatment of bone.



A. arabica causes a significant increase in the calcium content in the diaphyseal and metaphyseal tissues. The effect could be due to the steroidal content present in drug extracts. So *A. arabica* can be used as an anti-osteoporotic agent ({{cite web | title=Effect of Acacia Arabica Extracts on Bone Calcium Content | year=2013 | url=http://citeweb.info/20132524083 | author=Nimisha Kakadia | author=Niranjan S. Kanaki}})

The diaphysis (/da□□æf□s□s/) is the main or midsection (shaft) of a long bone. It is made up of cortical bone and usually contains bone marrow and adipose tissue (fat). It is a middle tubular part composed of compact bone which surrounds a central marrow cavity which contains red or yellow marrow.

The *metaphysis* (/mət□æf□s□s/) is the wide portion of a long bone between the epiphysis and the narrow *diaphysis*. It contains the growth plate, the part of the bone that grows during childhood and as it grows, it ossifies near the *diaphysis* and the epiphyses.

Substitute

Sandal sufaid (white sandal wood)[21-24]; masoor ki daal (gram)[10,22,23]; rasaut (wild turmeric)[22,23]; sasaut is the best substitute for pods[21]; dammul akhwain (dragon blood)[22].

Parts Used and Dosage

Babool leaves, bark and fruit are beneficial therapeutically. Bark decoction 30–80 mL; bark powder 3–6 gm; leaves powder 3–6 gm; and fruit powder 3–6 gm.

Precautions and Side Effects

The babbula sometime causes bloating, intestinal gas, more frequent bowel movement and skin inflammation and intravenous injection of gum arabic may cause kidney and liver damage. Combining herbs with certain drugs may alter their action or produce unwanted side effects. Some it produces obstruction also.[25] There are no serious side effects. It is good to avoid babbula during constipation.

Conclusion

A. nilotica has been in use since ancient times to treat a wide range of diseases in traditional system medicine. Experimental studies have proven its antidiabetic, antihypertensive, antispasmodic, antibacterial, antifungal activity, antiplaque, antioxidant, antiplasmodic, antiviral activity, catalytic and galactagogue. Scientific studies have proven the claims of traditional system of medicine. Further, more detailed clinical researches are needed to explore its medicinal value in order to osteoporosis, it as a standard drug.

Conflicts of interest: Nil

References

1. Prasad G, Reshmi MV. *A Manual of Agrosbios (India)* 2007; 97-99.
2. Chughtai HM, Chughtai H. Rehnumae Aqaqeer. New Delhi: *Aijaz Publishing House* 229-39.
3. Kirtikar KR, Basu BD. Indian Medicinal Plants. Dehradun: *International Book Distributors* 922.

4. Said HM. Hamdard Pharmacopeia of Eastern Medicine. 2nd Edn. Delhi-India: *Sri Satguru Publication, A Division of Indian Book Centre* 1997; 353.
5. Nandkarni KM. Indian Materia Medica. Mumbai: *Popular Prakashan Private Limited* 2010; 9-10.
6. Khare CP. Indian Medicinal Plants. New Delhi: *Springer (India) Private Limited* 2007; 4-5.
7. Nadkarni KM. The Indian Plants and Drugs. New Delhi: *Shrishti Book Distributors* 2005; 4-5.
8. Anonymous. The Wealth of India, Raw materials. Vol 9. New Delhi: *CSIR* 2003, 37-41.
9. Said HM. Hamdard Pharmacopeia of Eastern Medicine. 2nd Edn. New Delhi: *Sri Satguru Publications* 1997; 353~89. *Journal of Pharmacognosy and Phytochemistry*
10. Ray AB, Sharma BK, Singh UP. Medicinal Properties of Plants: Antifungal, Antibacterial and Antiviral Activities. Lucknow: *International Book Distributing Co.* 2004; 3-4.
11. Khan A. Muheete Azam. Vol I. Kanpur: *Nizami Press* 2004; 1313(AH): 181-83.
12. Kritikar KR, Basu BD. Indian medicinal plants with illustrations. Edn 2. *Uttaranchal Oriental Press* 2003; 4: 1289-92.
13. Kabiruddin HM. Ilmul Advia Nafeesi. New Delhi: *Aijaz Publishing House* 2007; 245.
14. Said HM. Hamdard Pharmacopeia of Eastern Medicine. Edn 2. New Delhi: *Sri Satguru Publications* 1997; 353.
15. Chatterjee A, Pakrashi SC. The Treatise on Indian Medicinal Plants. New Delhi: *NISCAIR Press* 2000; 2: 51-53.
16. Gulco P. Medicinal Plants in Folklores of Bihar and Orissa. New Delhi: *CCRUM* 2001.
17. Asolkar LV, Kakkar KK, Chakre OJ. Glossary of Indian medicinal plants with active principles. Part I (A-K). New Delhi: *NISCAIR* and *CSIR* 2005; 10-11.
18. Dymock W, Warden CJH, Hooper D. Pharmacographica Indica. A History of the principal drugs of vegetable origin. New Delhi: *Shrishti Book Distributors* 2005; 1: 556.
19. Gilani AH, Shaheen F, Zaman M et al. Studies on antihypertensive and antispasmodic activities of methanol extract of *Acacia nilotica* pods. *Phytotheraphy Research B* 1999; 665.
20. Nishteswar K. Text Book of Dravyaguna (Part A,B). Varanasi: *Chaukhamba Surbharti Prakashan* 2007; 445.
21. Khan A. *Muheete Azam.* Kanpur: *Nizami Press* 1313(AH): I: 181-83.
22. Ghani MN. Khazainul Advia. New Delhi: *Idarae Kitabul Shifa YNM* 254.
23. Hakim A. Bustanul Mufredat. Part I. New Delhi: *Idarae Kitabul Shifa* 2002; 64-65.
24. Antaki AD. Tazkiradu Ulil Albab. Edn 1. Beirut: *Dar Alkutub Al Ilmiyah* 1998; 1-3.
25. Kokate CK, Purohit AP, Gokhate SB. Pharmacognosy. Edn 43. Pune: *India Nirali Prakashan* 2009; 7: 12.

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