

PHARMACOLOGICAL INVESTIGATIONS ON AQAQIA – *Acacia arabica* (Lam.) Willd.

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ABSTRACT

The use of medicinal plants for the prevention and treatment of various ailments has been in practice from the time immemorial. *Acacia arabica* (Lam.) Willd. belonging to family Fabaceae has been reported to be effective against a variety of disease such as diabetes, hypertension, skin disorders and cancer. The plant has been mentioned by the name of Aqaqia or Ummeghilan in ancient Unani literature. Different parts of the plant viz., Gum, Bark, Leaves, Flowers, Seeds and Pods are used as medicine among various ethnic and rural societies. Gum acacia is the dried gummy exudate which is popularly known as Samgh arabi in traditional Unani medicine. The parts of the plant are considered as astringent, demulcent, emollient, aphrodisiac, haemostatic, anti-diarrhoeal with good nutritional value in Unani medicine. This communication is an attempt to compile and document information on different aspects of *Acacia arabica* mentioned in classical Unani as well as modern literature. The plant has been suggested to be taken up for further scientific investigations so as to validate the medicinal claims presented herein and to utilize its maximum therapeutic potential.

Keywords: *Acacia arabica* (Lam.) Willd., Fabaceae, Aqaqia, Samgh arabi, Unani medicine

INTRODUCTION

The word Acacia is derived from Greek word 'akakia'; given to a thorny Egyptian shrub by ancient Unani physician Dioscorides (370 B.C.). He, for the first time described its exudates as 'kommi' from which the term "gum" evolved later on (Ibn sina, 1998; Chughtai, 1940; Bentley and Trimen, 1991). *Acacia* species are commonly known as 'Babool' or kikar in India and ethnomedicinally have long been used for the treatment of various diseases. 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, 2003; Orchard, 2003).

Synonyms: *Acacia nilotica* (Linn.); *Mimosa nilotica* (Linn.); *Mimosa arabica* (Lam.)

Common and Regional names

Arabic: Aqaqia, Ummeghilan, Mughilan, Qaraz; Ben: Babla, Babul, Babur, Kikar; Eng: Indian Gum, Arabic Gum tree, Black thorn, Egyptian thorn, Prickly acacia; Egypt: Sant, Sunt; Greek: Kommi; Guj: Babalia, Baval; Hin: Babla, Babul, Babur, Kikar; Mal: Karivelam, Karuvelakam; Pers: Kharemughilan; Punj: Babla, Babul, Babur, Kikar; San: Vabbula, Babbulaka, Vavari; Tam: Karuvel; Tel: Nallatumma; Urdu: Babool, Kikar

TAXONOMY

Kingdom	Plantae
Phylum	Spermatophyta
Subphylum	Angiospermae
Class	Dicotyledonae
Order	Fabales
Family	Fabaceae (Leguminosae)
Subfamily	Mimosoideae
Genus	Acacia
Species	Arabica

Morphological description

A small tree with dark brown or black longitudinally fissured bark; branchlets slender, terete, pubescent when young. Leaves 2-pinnate, 5-10 cm long; main rachis downy, often furnished with glands; petioles 2.5-5 cm long; stipular spines very variable, 0.6-5 cm long, smooth usually whitish, straight, sharp, often absent; pinnae 4-9 pairs, 2-5 cm long, shortly stalked. Leaflets subsessile, 10-25 pairs, 3-6 by 1.2-2mm, linear-oblong, subobtusate, glabrous or nearly so; Flowers yellow, in globose heads; peduncles axillary, in fascicles of 2-6, terete, pubescent; bracteoles 2, above the middle of the peduncle, broadly ovate, acute, pubescent; Calyx campanulate, 1.2 mm long; teeth very short. Corolla 3 mm long; lobes short, triangular; Pods stalked, 7.5-15 by 1.3-1.6 cm, moniliform, compressed, constricted at the sutures between the seeds, densely and persistently grey downy, seeds 8-

12. Samgh-Arabi (Gum acacia) is the dried gummy exudate obtained from the stem and branches of *Acacia arabica* tree. Gum acacia occurs in rounded or ovoid; irregular or broken tears, 1-3 cm in diameter. Outer surface contains numerous fine cracks. Colour is white or pale yellow. The gum is very brittle and the exposed surface is transparent and glassy. It is odourless and taste is bland and mucilaginous (Ali, 2003; Wallis, 1985). All parts viz. fruits, flowers, gum, bark, leaves, seeds and pods are used for medicinal purpose (Kirtikar and Basu, 1988).

Collection

Tree bears flowers and fruits, its leaves and fruits are pounded together and an extract is obtained which is known as Aqaqia (Ibn-Sina, 1998). Gum acacia is a natural liquid product which at certain seasons is formed in such large quantities that it bursts through the tissues of the stem and branches, and subsequently hardens by exposure to the air. Therefore, gum acacia exudes spontaneously, and so freely, that wounding the bark is unnecessary; but in some districts the outflow is facilitated by incisions (Bentley and Trimen, 1991).

PHYTOCHEMICAL CONSTITUENTS

To date, approximately 330 compounds have been isolated from various *Acacia* species. Flavonoids, a type of water-soluble plant pigments, are the major class of compounds isolated from *Acacias*. Approximately 180 different flavonoids have been identified, 111 of which are flavans. Terpenoids are second largest class of compounds isolated from species of the *Acacia* genus, with 48 compounds having been identified. Other classes of compounds isolated from *Acacia* include, alkaloids (28), amino acids/peptides (20), tannins (16), carbohydrates (15), oxygen heterocycles (15) and aliphatic compounds (10). Gum acacia consists essentially of an acid called arabic acid, gummic acid, or arabin, in combination with calcium, magnesium and potassium. This mixture of salts forms about 70% of the gum; the remainder consists of enzymes like oxidases, pectinases, diastases, and mallic acid, sugar, water and moisture. Tannins are present in variable amounts in bark, pod (22-44%), leaves (32%). (Buckingham, 2001; Bentley and Trimen, 1991; Nadkarni, 1989; Chughtai, 1940; Nigwami, 1985; Chopra, 1956)

Bark: The bark is prosperous in phenolics, condensed tannin and phlobatannin, gallic acid, protocatechuic acid, pyrocatechol, (+)- catechin, (-) epigallocatechin-7-gallate, and (-) epigallocatechin-5,7- digallate, (-) epicatechin, (+) dicatechin, quercetin, (+) leucocyanidin gallate, sucrose and (+) catechin-5-gallate. It contain 12- 20% of tannin. Bark contains a large quantity of tannin. (Ali,2012;Malviya,2011;Khare,2007;Chatterjee,2000;Prajapati,2009;Anonymous,2003;Banso,2009;Yasir,2012;Anonymous,2000)

Gum: Gum contains galactose, L-rhamnose, L-arabinose and four aldobiouronic acids, viz. 6-o-(β -glucopyranosyluronic acid)-D-galactose; 6-o-(4-o-methyl- β -D-glucopyranosyluronic acid)-D-galactose; 4-o-(α -D-glucopyranosyluronic acid)-D-galactose; and 4o-(4-o-methyl- α -D- glucopyranosyluronic acid)-D- galactose. (Khare,2007;Chatterjee,2000;Prajapati,2009;Anonymous,2003)

Fruit: It contains a high percentage of phenolic constituents consisting of m-digallic acid, gallic acid, its methyl and ethyl esters, protocatechuic and ellagic acids, leucocyanidin, m-digallic dimer 3,4,5,7-tetrahydroxy flavan-3-ol, oligomer 3,4,7-trihydroxy flavan 3,4-diol and 3,4,5,7-tetrahydroxy flavan-3-ol and (-) epicatechol. Fruit also contains mucilage and saponins. It contains 32% tannin. (Chopra,2002)

Flowers and pods: Flowers contain stearic acid, kaempferol-3- glucoside, isoquercetin, leucocyanidin. Pods contain tannin 22-44%, expressed in terms of oxalic acid; Wood contains chlorides. (Khare,2007;Chatterjee,2000;Anonymous,2003;Anonymous,2000)

Seeds contain amino acids, fatty acids, ascorbic acid and tannin as a major constituent, moisture 14%, ash 3-4% ; pods have got 22-44% tannin. (Chatterjee,2000;Prajapati,2009)

Leaves: It contains apigenin, 6-8-bis-D-glucoside, rutin and 32% tannin. (Chopra,2002)

TEMPERAMENT

A clear difference of opinion among Unani scholars regarding the temperament of plant is as follows: Barid-Yabis (cold and dry) in second degree (Ibn-Sina, 1998; Chughtai, 1940; Nigwami, 1985; Ali, 2010) Har-Yabis (hot and dry) in second degree (Ghani, 1921)

ETHNOBOTANICAL USES

Extract of wild gum Arabic tree is astringent thus prevents haemorrhages. It blackens the hair, clears complexion and is useful for fissures caused by cold. It is also useful for dakhas (whitlow), hirq (fire burns), busoor-e-lubni (pimples), warm-e-har (hot inflammation), qula dehan (mouth ulcers) and prevents istarkhae mafasil (flabbiness of joints). Egyptian variety of *Acacia* is good for eyes which strengthens the vision and useful in eye disorders like rumud (conjunctivitis), dhalka (epiphora) and zufrak (pterygium). Also, it is useful for sahaj-e-ama, (intestinal abrasions), ishaal-e-damvi (haemorrhagic diarrhoea), seelan-ur-reham (leucorrhoea), kuruje miqad wa nutue rehman (rectal and uterine prolepses) (Ibn-Sina, 1998; Ghani, 1921; Chughtai, 1940). Decoctions of thorns and root are used to treat fawaaq (hiccups) and dard e shikam (abdominal pain) respectively. Extracts of other parts of the plant are used for the treatment of bawasir e damiya (bleeding piles) and yarqan (jaundice). Local application of Gum Acacia (GA) or Samgh arabi is beneficial in relieving Suda Har (headache). Paste of flowers or extract of pods/bark is useful in treating Qula (oral thrush) and atshaki zakhm (syphilitic wounds) (Ghani, 1921; Chughtai, 1940). GA is useful in ziaabetes sukkari (diabetes mellitus), ishaal (diarrhoea) and zaheer (dysentery) (Ghani, 1921; Chughtai, 1940; Chopra, 1956; Kirtikar and Basu, 1988). GA possesses demulcent and emollient properties for which it is also useful in allaying irritation of throat, urinary bladder and urethra. Extract of pods is very effective in curing surat e inzal (premature ejaculation) and jiryman mani (spermorrhoea). Powder of gum acacia is useful in the treatment of kasrate haiz (menorrhagia) and seelanur reham (leucorrhoea). Flower extract is beneficial in insect and dog bite also. Application of flower paste is useful in qooba (fungal infection) while that of leaves is useful in healing wounds and relieving hot inflammations. Bark decoction is effective in treating juzam (leprosy) and syphilitic wounds (Ghani, 1921; Chughtai, 1940). Internally GA is used to treat the inflammatory bowel conditions and externally on the burns and scalds. Local application of GA is useful in arresting jiryman dam (haemorrhage) also.

Bark and unripe fruits are used for tanning and dyeing (Bentley and Trimen, 1991; Ali, 2003). Tender growing tops and pods are used as demulcent in cough. Its water extract is injected to relieve irritation in suzak (acute gonorrhoea), iltehab e masana (cystitis), bawaseer (piles), rectal prolaps (khuruje miqad) and seelan-ur-reham (leucorrhoea). Tender leaves and their decoction are used as astringent enema in zaheer (dysentery) & ishaal (diarrhoea). It is useful as a gargle in spongy gums, pyorrhoea, sore throat (sozish e halq), as decoction in suaal muzmin (chronic cough), nafsuddam (haemoptysis) and as wash in qarhae damviya (haemorrhagic ulcers) and jarahat (wounds). Flower extract is beneficial in khafqaan (palpitation). Gum and decoction of the bark are given as an astringent tonic in ziabetus sukkari (diabetes mellitus). Powdered gum is useful as nutritive and muqawwi baah (aphrodisiac) in sexual debility (Ghani, 1921; Chughtai, 1940; Nadkarni, 1989).

EVIDENCE BASED PHARMACOLOGICAL ACTIVITIES: Several researches have reported different biological activities of *Acacia arabica* in various *in-vitro* and *in-vivo* test models. Some of them with high translational value have been mentioned in detail under following headings:

Hypoglycemic Activity: Administration of powdered seeds of *Acacia arabica* in doses of 2, 3 and 4 gm/kg body-weight to normal and alloxan-diabetic rabbits, exerted a significant (P less than 0.05) hypoglycemic effect in normal rabbits. The hypoglycemic effect was not significant (P greater than 0.01) in alloxan diabetic rabbits. It suggests that the powdered seeds of *Acacia arabica* act by initiating the release of insulin from pancreatic β -cells of normal rabbits (Wadood et al, 1989). The bark in the form of decoction (20 mg/kg) as well as the standard drug talbutamide produced a significant reduction in blood glucose levels in mild alloxonised diabetic rabbits fasted for 18 hr (Bhandari MM, 1978). *Acacia nilotica* ssp. Indica fed for one week were found to exhibit hypoglycaemic effect (blood sugar lowered by 25.05%) in normal rats, but did not show any significant hypoglycaemic effect in alloxanised diabetic rats (blood sugar lowered by 2.14%). The hypoglycaemic effect of the legumes was due to its direct or indirect stimulation of β -cells of islets of langerhans to secrete more insulin (Singh et al, 1975). Gum arabic supplementation in human subjects with type-2 DM showed highly significant (P <0.001) decrease in fasting blood glucose and HbA1c (Omama et al, 2016).

Antihypertensive Activity: It was reported that methanolic extract of *A. arabica* reduces the arterial blood pressure and provides evidence of antihypertensive activities independent of muscarinic receptor stimulation (Gilani et al., 1999). An aqueous extract of *A. arabica* was also observed to have a sustained dose-related contractile activity on the isolated guinea-pig ileum. Intravenous administration of the extract produced a dose-related significant elevation of blood pressure (Amos et al., 1999). An antihypertensive action of Gum Arabic (GA) has also been demonstrated in human subjects (Al Mosawi AJ, 2002). Significant drops in systolic and diastolic blood pressure were seen in type-2 diabetic human subjects following regular intake of 10 gm/day GA for 16 weeks suggesting its antihypertensive effect (Omama et al, 2016).

Antispasmodic Activity: It was reported that *A. nilotica* (methanolic extract) inhibits the spontaneous contraction of rabbit jejunum in a dose-dependent (0.1– 3.0 mg/mL) manner. It also inhibits K^+ induced contractions. The mechanism behind which is calcium channel blockade that results in lowering of blood pressure (Gilani et al., 1999).

Antiplatelet Aggregatory Activity: It was reported that the extract of *Acacia 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 (anti-thrombotic) activity of the extract is mainly due to blockade of Ca^{2+} channels, although evidence suggests the involvement of protein kinase also (Shah et al., 1997).

Antiquorum Sensing Activity: This activity is shown by HEF (pH 4) and HCF obtained from various extracts of *Acacia nilotica* (Singh et al., 2009).

Antiobesity Activity: Highly significant and significant reductions in BMI were seen among prediabetic and diabetic groups respectively following regular intake of 10 gm/day Gum Arabic (GA) for 16 weeks (Omama et al, 2016).

Nephroprotective Activity: Study on humans showed a favourable influence of GA treatment in diabetic nephropathy with clear decrease in BUN and creatinine concentration. GA was also found to increase fecal nitrogen excretion, providing an additional approach to lowering serum urea nitrogen. In rat models of acute gentamicin nephrotoxicity, GA modestly ameliorated histological and biochemical parameters. A marked decrease of albumin and uric acid following GA treatment further supports its nephroprotective activity (Omama et al, 2016).

Antimutagenic Activity: It was shown that methanolic extract of the bark decreased the UV- induced mutagenicity using *E. coli* WP-2 in a dose of 5 mg/plate. This decrease might be due to some enzymatic action which reverted the formation of pyrimidine dimmers (Jain et al., 1987). Gallic acid and polyphenols present in acetone extract of the plant are responsible for the antimutagenic activity (Kaur et al., 2005). Acetone extract of *Acacia nilotica* 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 *S. typhi* (Arora et al., 2003)

Chemopreventive, Cytotoxic and Anti-Hepatocarcinogenic Activities: It was reported that the leaf extract of *A. nilotica* had significant chemopreventive and anti-mutagenic activity than the other parts (Kalaivani and Mathew, 2010). The chemopreventive activity of *A. nilotica* gum, flower and leaf aqueous extracts, on 7,12-DMBA induced skin papilloma in male swiss albino mice has been found (Meena et al., 2006). *Acacia nilotica* acetone extract exhibited cytotoxic activity which is increased by gallic acid and other polyphenols (Kaur et al., 2005). *Acacia nilotica* bark extract prevented hepatic malondialdehyde (MDA) formation and reduced glutathione (GSH) in N-nitrosodiethylamine treated rats. It reduced liver injury and restored liver cancer markers (Singh et al., 2009).

Antiproteolytic Activity: *Acacia* seed extract displayed more pronounced inhibitory action on human trypsin and chymotrypsin, whereas it was more effective in inhibiting the total proteolytic activity of the bovine system (Sudhakar, 1984).

Antifertility Activity: The aqueous extract of the flowers showed 11.5 % abortifacient activity in rats. It was further screened for teratological abnormalities in pregnant rats. The fetuses showed gross external morphological and skeletal defects (Sethi N.,

1989). The extract of the stem bark at 2% concentration revealed semen coagulant activity in a preliminary screening (Bhatt B.P., 1990).

Antibacterial Activity: The stem bark extract exhibited antimicrobial property against *Streptococcus viridans*, *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis* and *Shigella sonnei* using agar diffusion method suggesting *A. nilotica* as a potential source of antimicrobial agents (Saini M.L., 2008). The alcoholic extract of gum, leaf and fruit were revealed *in vitro* antibacterial activity against *Staphy. aureus* using agar diffusion method (Banso A., 2009). Alcoholic and water extract of the bark exhibited significant *in vitro* antibacterial activity against *Strep. pyogenes*, *Staphy. aureus*, *E. coli*, *S. typhi* and *Klebsiella* using disc method. Both the extracts were highly inhibitory to gram positive organism in comparison with gram negative. (Raghavendra M.P., 2006).

Antifungal Activity: In comparative antimicrobial studies of *Acacia* species; *A. nilotica* exhibited highest activity against three bacterial (*E. coli*, *S. aureus* and *S. typhi*) and two fungal (*Candida albicans* and *Aspergillus niger*) strains (Saini M.L., 2008). Methanolic and aq. extracts of *A. nilotica* showed antifungal activity with percentage inhibition ranging from 34.27 ± 1.45 to 93.35 ± 1.99 (Mahesh et al., 2008; Satish et al., 2007).

Antiviral Activity: Methanolic extracts of *Acacia arabica* seeds showed good antibacterial activity and also MIC of different viruses using different cell cultures, but MIC of Herpes simplex - 1 & 2, vaccinia virus, vesicular stomatitis and Herpes simplex-1 were significant suggesting antiviral activity of *Acacia arabica* seeds extracts (Parmar et al., 2010). Methanolic extract of the plant is active against two animal viruses; Newcastle Disease and Fowl pox Viruses (Mohamed et al., 2010). Ashfaq et al reported the antiviral activity of *Acacia nilotica* (*A. arabica*) against Hepatitis C Virus in infected liver cells. The results explain that acetonetic and methanolic extracts of *Acacia arabica* showed more than 50% reduction in non-toxic concentration (Ashfaq et al., 2011).

Antiplasmodial Activity: The ethyl acetate extract holds the highest activity on *Plasmodium falciparum*. Phytochemical analysis indicated that the most active phase contained terpenoids and tannins and was devoid of alkaloids and saponins (El-Tahir et al., 1999). Crude methanolic root extracts of *A. nilotica* reveals significant activity against chloroquine sensitive strain of *Plasmodium berghei* in mice (Jigram, 2010). Aqueous root extract (100, 200, and 400 mg extract/kg) of *A. nilotica* was analyzed for antiplasmodial activity in mice. Suppressing activity, curative and prophylactic effect was studied in chloroquine-sensitive *Plasmodium berghei* NK 65 infected mice. All doses of the extract produced significant, dose dependent, chemo suppressive activity against the parasite in the suppressive, curative and prophylactic tests comparable to the group treated with chloroquine (Alli et al., 2011).

Antidiarrhoeal Activity: Five medicinal plants [*Acacia nilotica*, *Acanthospermum hispidum*, *Gmelina arborea*, *Parkia biglobosa* and *Vitex doniana*] used in diarrhoeal treatment in Kaduna State, Nigeria, were investigated. This study was carried out on perfused isolated rabbit jejunum and castor oil-induced diarrhoea in mice. The aqueous methanol extracts (0.5, 1.0, 2.0 and 3.0 mg/ml) were generally found to cause a dose-dependent response in the isolated rabbit jejunum, though this was not uniform in all the plants. *Gmelina arborea* and *Vitex doniana* showed concentration dependent relaxation at low doses (0.5, 1.0 mg/ml), but showed no significant relaxation at higher doses (2.0, 3.0 mg/ml). Other extracts showed biphasic effects. For example, *Acacia nilotica* at 3.0 mg/ml caused initial relaxation quickly followed by contraction. In the castor oil-induced diarrhoeal, 100% protections were shown by extracts of *Acacia nilotica* and *Parkia biglobosa* (100, 200 mg/kg) while *Vitex doniana* showed a dose-dependent effect (Agunua et al., 2005).

Acetyl Cholinesterase Inhibitory Activity: Acetyl cholinesterase is a basic aim in the treatment of Alzheimer's disease. It has been found that *A. nilotica* has effect on central nervous system activities due to potent Acetyl cholinesterase inhibitory activities. More investigations are required in the treatment of Alzheimer's (Crowch and Okello, 2009).

Antioxidant Activity: Water extract/fractions of *A. nilotica* (L.) in lipid peroxidation assay possess the peroxy radical scavenging capacity and results prove the anti-oxidant activity of plant. The bark powder of the plant extracts with different solvents found the scavenging activity using maceration extraction (Del, 2009). Another study reveals that *A. nilotica* is easily accessible source of natural antioxidants, which can be used as supplement to aid the therapy of free radical mediated diseases such as cancer, diabetes, inflammation, etc (Amos et al., 1999). Furthermore, the high scavenging property of *A. nilotica* may be due to hydroxyl groups existing in the phenolic compounds that can scavenge the free radicals (Kalaivani and Mathew, 2010).

Antiulcer Activity: The hydro-ethanolic extract of young seedless pods of *A. nilotica* was reported having antiulcer activity in pylorus ligation, swimming stress and NSAID induced rat ulcer models. The extract containing more amounts of phenolic components showed high antiulcer activity, indicating the phenolic component of the extract to be responsible for the activity of the extract (Bansal & Goel; 2012).

Galactagogue Activity: The aqueous extract of *Acacia nilotica* ssp was found to stimulate milk production in rats. The milk production is improved by 59% in first hour in rat (Eline et al., 2004).

Catalytic Activity: It is investigated that the leaf extract of *A. nilotica* is synthesized of gold nano-particles in water room temperature, which has been used as an efficient catalyst for the reduction of 4-nitrophenol to 4-aminophenol (Majumdar et al., 2013).

Clinical Studies: Single blind, plain controlled randomized study was conducted to evaluate the efficacy of Aqaqia (*Acacia arabica*) in improving Woman's Quality of Life in Nutue Rehm (Uterine Prolapse) with well validated Prolapse-Quality of Life (P-QOL) Questionnaire. Thirty subjects diagnosed with uterine prolapsed were selected and randomly divided into two groups: Group I – test group (*Acacia arabica* powder orally as well as pessary with pelvic floor muscle exercise) I, Group II-control group (Vitamin B complex with pelvic floor muscle exercise). Clinical evaluation was undertaken using the P-QOL questionnaire. The test group shows a significant improvement in quality of life in uterine prolapse patient as compared to a control group (Farzana et al., 2012)

A prospective, single blind, standard controlled randomized clinical trial on 45 patients (30 patients in test group and 15 in control group) with complaint of abnormal vaginal discharge or vulvovaginal pruritus. Married patients aged 18- 45 years with regular cycles and diagnosed as having BV were included in this study. Decoction of Chal babool was given orally (30gms twice

daily) for one month and standard drug Tab. Metronidazole (400mg twice daily) for 7 days was given in test and control group respectively. For diagnosis and cure rate of bacterial vaginosis, Amsel's criteria were used. Results: There was a significant improvement in the subjective and objective parameters; test drug was found to have similar effective as in control drug in the management of Bacterial Vaginosis (P =1.000) statistically (Jahufer R, 2014).

Prospective, randomized, placebo and positively controlled clinical trial was designed to evaluate the short-term clinical effects of a commercially available gel containing *Acacia arabica* in the reduction of plaque and gingival inflammation in subjects with gingivitis. Ninety subjects diagnosed with chronic generalized gingivitis were selected and randomly divided into three groups: Group I – placebo gel, Group II – gum tone gel and Group III – 1% chlorhexidine gel. Clinical evaluation was undertaken using the gingival index of Loe and Silness and the plaque index at baseline, 2 weeks, 4 weeks and 6 weeks. A subjective evaluation was undertaken by questionnaire. Gum tone gel showed significant clinical improvement in gingival and plaque index scores as compared to a placebo gel. This improvement was comparable to 1% chlorhexidine gel. Unlike chlorhexidine gel, gum tone gel was not associated with any discolouration of teeth or unpleasant taste (Pradeep et al., 2010).

In another study the potential of the polymeric component of aqueous extracts of gum acacia (GA) and the seeds of *M. oleifera* in wound management was evaluated. The results revealed that both biopolymers were haemostatic and hasten blood coagulation. They showed shortening of activated partial thromboplastin time and prothrombin time and were non-cytotoxic in nature. Both showed antibacterial activity against organisms known to be involved in wound infections with MIC ranging from 500-600 microg mL(-1) for GA and 300-700 microg mL(-1) for MSP. They were biodegradable and exhibited water absorption capacity in the range of 415 to 935%. The haemostatic character coupled to these properties envisions their potential in preparation of dressings for bleeding and profusely exuding wounds (Bhatnagar et al., 2013).

One study was conducted to assess the effect of Indian Gum Arabic pods powder on blood glucose and lipid levels of type 2 diabetic subjects. Forty five subjects with type 2 diabetes: age 45-65 years, male or female, not on insulin therapy, not taking medicine for other health conditions and fasting blood glucose levels between (110–300 mg/dl) were divided randomly in three groups. Group I, II and III consumed 2, 3 and 4 g of pods powder daily, respectively for four weeks. After 28 days the pods powder reduced the fasting blood glucose (10–19%), post prandial (7-35%), triglyceride (6-18%), LDL (7–10%), total cholesterol (5-11%), VLDL (7-15%), HDL cholesterol (5-10%) and blood pressure (8-13%) of the subjects. Changes were significant in the post prandial glucose level, triglyceride and VLDL cholesterol and blood pressure levels of the third group of subjects who were taking 4 g of pods powder daily (Pareek P, 2013).

ADVERSE EFFECTS

It causes constipation and injurious to intestines, rectum and chest unless used along with its musleh or correctives (Haleem, 1948; Ghani, 1921; Nasir, 1886).

CORRECTIVES

Few plants have been recommended by Unani scholars to be used along with aqaqia to counter it's adverse effects in humans like: Kateera (*Sterculia urens*) for correcting constipation (Haleem, 1948; Ghani, 1921) and Behi daana (*Cydonia oblonga*); Gulaab (*Rosa Damascus*); Sandal (*Pterocarpus santalinus*) for correcting ill effects on rectum (Ghani, 1921; Nasir, 1886)

SUBSTITUTES

Samgh e Dhaak (*Butea frondosa*), Hab ul Aas (*Myrtus communis*), Gond Badam Sheerin (*Prunus amygdalus*) have been mentioned in classical Unani literature as it's substitutes (Ghani, 1921).

UNANI COMPOUND FORMULATIONS

Habb-e-Mubarak, Habb-e-Sil, Laooq-e-Sapistan, Sanoon-post-Mugheelan, Habb-e-Babool, Habb-e-Tap-e-Balghami, Kushta Qalai, Qurs Gulnar, Qurs Ziabetus (Ali, 2010, Chughtai, 1940)

CONCLUSION

Acacia arabica has been in use since ancient times to treat wide range of diseases in Unani system of medicine. In the present comprehensive review, we referred primary and secondary data to compile the information based on taxonomy, distribution, morphological description, phyto-chemical constituents, ethnobotanical and pharmacological claims on *Acacia arabica*. Though traditionally the plant used widely for the treatment of various ailments, but scientifically only few of them were screened out. Thus more scientific studies must be conducted to investigate the unexploited potential of *Acacia arabica* (Lam.).

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