



THE THERAPEUTIC USES AND PHARMACOPEAL ACTION OF BADAM TALKH (*PRUNUS AMYGDALUS AMARA.*): A REVIEW

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ABSTRACT

The Unani System of Medicine (USM) is one of the traditional system of medicine that deals with plants. Plants are a large source of medicine. *Badam* is one of the plant origin drug, has been used for various therapeutic purposes in USM. Its active constituents are responsible for their actions described in Unani classical literature such as *Mudirr-e-bawl* (Diuretic) *wo Mudirr-e-hayd* (Emmenagogue), *Muhamir* (Rubefacient), *Hazim* (Digestive), *Mulaiyan* (Laxative), *Mufattit-i-hasah* (Lithotriptic), *Mohallil-e-warm* (Anti-inflammatory), *Mussakin-e-alam* (Analgesic), *Mulid-e-safra*, *Musshil* (Purgative), *Munaffis-e-balgham* (Expectorant), *Jaali* (Cleanser/Detergent), *Muffateh* (Deobstruent). This is a review paper which discusses morphology, pharmacological action, ethno-medicinal and therapeutic uses of this medicinal plant in perspective of Unani medicine. This review has been done through online searches of databases such as PubMed, Google Scholar, Embase, science direct and hand search for classical textbook available in different libraries. It concluded, that badam has Antiulcer, Antibacterial, Antioxidant, Antihypertensive, Anti-inflammatory, Anti-edema, Antidiabetic, Antifungal, Anticancerous, Fertility, Hepatoprotective, Hyperlipidemic and Nephro-protective properties.

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INTRODUCTION

Recent year's Unani medicines got medicinal and economical implications.¹ Plants are a rich source of medicine and are major part of Unani System of Medicine (USM). Mostly 70% of plants are used for formation of synthetic medicine. According to W.H.O 80% of the humans in developing country depend on herbal medicine for their primary health.^{2,3,4} In India, mankind started using herbal products and plants successfully as a source for the treatment of diseases and injuries.⁵ Germany and France together represent 45% of the 23 billion global retail market of herbal medicine in 2013. Therefore, nowadays traditional medicine become focus of interest, because of its

wealthy source of metabolites that are potential source of drugs and essential oils.⁴ In recent years, food and health aspects are receiving special attention from the general public.⁶ Unani system of medicine has three principal for treatment of diseases of human body i.e. *ilaj-bil-giza*, *ilaj-bil-dawa* and *ilaj-bil-yad*. First in USM *hakeems* go through *ilaj-bil-giza* (dietotherapy) then, through *ilaj-bil-dawa* (pharmacotherapy) and lastly with *ilaj-bil-yad* (surgery).⁷ In USM for prevention of disease its necessary to take a well-balanced diet for good health.⁸ The role of diets and drinks for health issues has been considered very much significant since from Hippocrates (460-370 BC). Other ancient Unani physicians like Aristotle

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(384-322BC), Celus (53BC-7AD) and Galen (130-200 AD) had also emphasized on the use of various food items for the treatment of common and specific ailments of the human body.⁹ Since ancient times various foods were used as medicine for prevention and treatment of diseases. *Badam* (*Prunus amygdalus* Bail.) is most popular nutritional herbal medicine used as food. Almond also known as the 'King of nuts' contains Kernel which is a rich source of protein of large calories of 575 kcal 100 g and 50% of fat. The total fat content is made up of 62% monounsaturated fatty acids (MUFA) and 24% of polyunsaturated fatty acids (PUFA). Fatty acids from almonds are beneficial for health. Frequently consumption of almonds reduced risk of cardiovascular disease and sudden cardiac death by lowering blood cholesterol level and preserve low density lipoprotein (LDL). Hence, it is very useful for body building as well as for enhancing brain power. Therefore used in cerebral abnormalities such as loss of memory, insomnia, and headache.^{7,10,11} *Badam* (almond) is the seeds of plant known as *Prunus amygdalus* Bail. Belongs to *Rosaceae* family native to the Middle East and South Asia and cultivated in Greece and China for centuries. Nowadays cultivated mainly in the Mediterranean region and in California. In India almond is the regional cheap and principal crop of Kashmir and Punjab (Abdullah et al., 2017).¹² It is used as snacks for garnishing food and in making sweet dishes. Various study revealed, that it reduces low density lipoprotein (LDL), cholesterol, reduces risk of colon cancer, diabetes and heart diseases.^{12,13,14,15} Almond contains fats, proteins, minerals (iron, copper), and vitamins, hence used for treatment of anemia and general weakness and is effective for health building and brain development.^{12,16} *Badam* (*Prunus amygdalus* Bail.) has cosmetic values as it contains 44-55% of fixed oil.¹⁴ Anatomy of almond seeds consists of kernel, middle shell, outer green shell or almond hull and a thin leathery layer (seed coat).¹⁷ On the basis of distribution *Badam* (*Prunus amygdalus* Bail.) has three types 1) *Bustani* (cultivated), 2) *Jangali* (forest), and 3) *Pahadi* (hilly). On the basis of taste it is divided into two types 1) *Badam Shireen* (Sweet Almond (*Prunus amygdalus dulcis*)) and 2) *Badam Talkh* (Bitter Almond, (*Prunus Amygdalus amara*)).^{12, 17, 18} These are differentiated according to their flower. Sweet almond flowers are white in color, whereas the Bitter almond flowers are pink in color. The bitter almond is slightly broader and shorter than the sweet almond.^{19,16}

Morphology:

Badam Talkh (*Prunus Amygdalus amara*.) is one of the unani medicine mostly used externally, also known as *prunus dulis* (Muller). It is a medium sized deciduous tree up to 8m tall belongs to *Rosaceae* family. Leaves are alternate, oblong-lanceolate, small in size, red in color with fragmented. Flowers white tinged with red, appearing before or with the early foliage. Fruit drupe, flesh splitting at maturity exposed the pitted stones. Anatomy of almond seeds consists of kernel, middle shell, outer green shell or almond hull and a thin leathery layer (seed coat). Seed is flat and bitter in taste. Bitter almond has unpleasant odour and is small in size and is distributed in eastern Mediterranean. In India, it is cultivated in Kashmir and Punjab.^{22,2} *Badam Talkh* (*Prunus Amygdalus amara*.) has different name in different country, in Arab known as lauz.²⁴ After eating *Badam Talkh* (*Prunus Amygdalus amara*.) by fox then it cause death.^{17,18} Bitter almond flowers are pink in color. The bitter almond is slightly broader and shorter than the sweet almond.^{19,16} Bitter almonds yield 4-9 mg of hydrogen cyanide per almond. *Badam Talkh* (*Prunus Amygdalus amara*.) is due its contents cyanogenic diglucoside amygdalin after metabolization that yields hydrogen cyanide in the body. After ingestion of 6 to 10 may cause serious poisoning and 50 can kill a man. The binding of cyanide ions on cytochrome oxidase lead to a non-hypoxemic hypoxia by blocking the cellular respiratory chain.^{20,21}

Common name:

Arabi: lauzul mar, **Persian:** badam talk, **Bengali:** badam, **Gujrati:** badam, **Hindi:** kadhwa badam, **Kannadh:** Badamu, **Sendhi:** kodha badam, **Malyalum:** Badam, **Telgu:** Badam vittulu, **Tamil:** Vadam-kottai, **Trade name:** Almond.^{23,25,26}

Medicinal uses:

Badam talkh (*Prunus Amygdalus amara*.) is a poisonous drug hence used externally. Almond oil extracted by expression of kernels. Oil has demulcent, antispasmodic, sedative, laxative, vulnerary and rejuvenating properties. It has similar action as olive oil and used in emollient preparations including nourishing cream, skin and cold creams. The oil is useful in cough, burning sensation, cracked skin, and amentia. Almond kernel is considered as highly nutritious, demulcent and stimulant, nervine tonic in indigestion medicine. They are also considered lithotriptic and diuretic, their poultice useful for irritable sores and skin eruption. The kernel is

valuable in peptic ulcer. The unripe fruit is given as an astringent application to the gums and mouth.²³ The bitter seeds has bad taste, good in inflammation, ascites, headache, weakness of eye, bronchitis, old ulcer, scabies, hydrophobia.²⁷ *Badam talkh* (*Prunus Amygdalus* amara.) oil used for killing of lice, earache and tinnitus (eardrop).²⁶

Special action:

Skin diseases and *Muddir hayz* (Emmenogogue).^{25,28}

Active constituents:

Fat, Protein, Gum, Fixed oil, Amygdalin, Glucocynide acid, Hydrocynide acid, Essential oil, Cyanogenic diglucoside.^{12,20,21,29}

Actions mentioned in USM:

Mudirr-e-bawl (Diuretic) *wo Mudirr-e-hayd* (Emmenogogue), *Muhamir* (Rubefacient), *Hazim* (Digestive), *Mulaiyan* (Laxative), *Mufattit-i-hasah* (Lithotriptic), *Mohallil-e-warm* (Anti-inflammatory), *Mussakin-e-alam* (Analgesic), *Mulid-e-safra*, *Musshil* (Purgative), *Munaffis-e-balgham* (Expectorant), *Jaali* (Cleanser/Detergent), *Muffateh* (Deobstruent).^{17,18,25,26,28}

Therapeutic uses in USM:

Roots of *Badam talkh* (*Prunus Amygdalus* amara.) boiled and make *zimad* (paste), applied on face for the treatment of melasma, when used as a pessary than act as *mudir hayd* (emmenogogue) and abortifacient. *Badam talkh* (*Prunus Amygdalus* amara.) mixed with vinegar and rogan-e-gul (rose oil) beneficial for chronic wound, ulcers and act as antidote for dog bite. In case of respiratory diseases especially for hemoptysis it was mixed with *Gundum* (*Triticum aestivum*) and *pudina* (*Mentha arvensis*). *Badam talkh* (*Prunus Amygdalus* amara.) mixed with honey and milk beneficial for liver diseases, spleen pain and colicky pain. Daily uses of 5 *Badam talkh* (*Prunus Amygdalus* amara.) use a preventive measures for Diabetes mellitus. *Badam talkh* (*Prunus Amygdalus* amara.) with *neshasta* (*Triticum aestivum*) use for the treatment of cough, asthma, lung inflammation, bronchitis, pleurisy. When it used with *pudina* (*Mentha arvensis*) beneficial for treatment of kidney

pain. *Badam talkh* (*Prunus Amygdalus* amara.) with honey beneficial for liver in the treatment of jaundice, spleen diseases, kidney diseases and their obstructions. Take water and honey (4:1 ratio) formed *maul-asl* and take *Badam talkh* (*Prunus Amygdalus* amara.) effective for colic pain. When this was used locally for herpes zoster, kidney and bladder diseases such as kidney stone, oligouria, and uterine pain when this is used as pessary act as emenagogue. When *Badam talkh* (*Prunus Amygdalus* amara.) mixed with vinegar used locally for headache, chronic wound, ulcers, ring worm, dry and wet itching, herpes zoster, acne, tinea, scabies, hikka, seborrheic dermatitis and at place of dog bite. Made liniment of *Badam talkh* (*Prunus Amygdalus* amara.) for melasma, hyperpigmentation, freckles, and skin cracks due to cold. Make fine powder of *Badam talkh* (*Prunus Amygdalus* amara.) applied inside eye act as eye tonic. Take 21 gm *Badam talkh* (*Prunus Amygdalus* amara.) and mixed honey formed *lauq* (linctus) act as expectorant of viscid balgham. *Zimad* of *badam talkh* (*Prunus Amygdalus* amara.) act as analgesic for all type of pain. *Badam talkh* (*Prunus Amygdalus* amara.) with different formulation is very beneficial for splenitis, asthma, kidney pain, difficulty in urination, inversion of uterus and abortifacient. Gum of *badam talkh* cause constipation.^{17,18,24,25,26,28}

Therapeutic uses of Rogan-e-badam talkh (*Prunus Amygdalus* amara.):

Most commonly Rogan is use for treatment of headache, kidney stone, melasma, hyperpigmentation and improve fairness. Also beneficial for splenomegaly, kidney pain, urine retention, uteralgia, inversion of uterus, inflammation of uterus, amenorrhea, abortifacient, ear ache and tinnitus. Almond oil with vine used for treatment of boils. Formed paste and add oil applied on head for treatment of headache (due to common cold) and for the treatment of dandruff.^{18,26}

Therapeutic uses of Gum of badam talkh:

Gum of *badam talkh* is as similar as gum of *babul*. It uses for treatment of throat pain, cough and tubercular fever, after ingestion may cause constipation.¹⁸

Substitute (Badl) ^{17,26,28}	Corrective (Muslih) ^{17,26,28}	Toxic (Muzir) ^{17,16,28}	Oral Dose ^{28,26}	Temperament ^{17,18,26}
Habb-ul-mulib	Badam-e-shiri (<i>Prunus amygdalus</i> dulcis).	Intestine	½-1 piece Oil 18 gm	Hot ² and Dry ² Hot ² and Wet ²

Active constituents and its therapeutic uses:

Kernels contain pangamic acid or D-gluconodimethyl amino acetic acid; it considered essential nutritional factors in food and used to correct liner dysfunction and cardiovascular problems. Kernels contain lipid mainly stearic, palmitic acids, hexadecane and tetradecane were the major hydrocarbons. Squalene and β -sitosterol they show antimicrobial activity. Amygdalin isolated from bitter almond used orally in preclinical study in rats can significantly suppressed hormonal and cell mediated immunity and when it was given intravenously at high doses enhanced phagocytic activity. Almonds seeds by addition to avian egg yolk produce sialic acid its derivatives such as oligosaccharides is an active ingredient is used as an antiviral, anti-diarrhoeal, anti-ulcer, anti-inflammatory, antiallergic and bifidus growth accelerator agent. The plant yields contain soluble polysaccharids such as pectin and carrageenan used for different medicinal purposes. The almond extract or gum is used in the production of cosmetic, skin cleansers for prolonged release of perfumes. The plant is an important biofuel has high alkali content, which forms deposits on the boilers. This was due to high content of potassium in fuel. Specially designed holes for firing biomass have to be used, also for used for pregraphitic carbonaceous inclusion compounds, which are used as secondary battery anodes. Thermoplastic resin mouldings with good mechanical strength are prepared by injection or extrusion moulding from thermoplastic resins and agricultural products such as almond shell powder. The plant contains hydrocyanic acid and amygdaline and it is used for pest control. The seeds are useful for killing lice while the twigs are used to get rid of houseflies.²²

Pharmacological actions:**Central Nervous System:**

Oil of bitter almond mixed with rose oil and vinegar applied and massage locally for treatment of headache, insomnia and decrease dryness of brain.^{17,24,26,30,31,32}

Respiratory System:

Bitter almond has soothing effect there for beneficial for dry cough, chronic cough and pneumonia. Made paste of almond with wheat starch and mentha is very beneficial to stop haemoptysis. *Badam talkh* (*Prunus Amygdalus amara.*) with nashasta (*Triticum aestivum*) use for the treatment of cough, asthma, lung inflammation, bronchitis and pleurisy. Take 21 gm *Badam talkh* (*Prunus Amygdalus amara.*) and mixed

honey formed *lauq* (Linctus) act as expectorant of viscid balgham.^{12,24}

Urogenital System:

Bitter almond is very effective in vesicle ulcer, renal and vesicle stone. Hence, it helps to relieve dysuria, nephralgia, burning micturition, urine retention, uteralgia, inflammation and hardness of uterus, hysteria. its pessary act as emenagogue and abortifacient. The almonds are also used in different dosage forms for sexual debility.¹² *Badam talkh* (*Prunus amygdalus Batsch*) with mentha used for treatment of kidney pain. Take water and honey (4:1 ratio) formed maul asl and take badam talkh (*Prunus amygdalus Batsch*) effective for colic pain, kidney pain.²⁵

Gastro-intestinal Tract:

Almonds have laxative property hence beneficial in constipation, relief colic pain and also very useful in peptic ulcer. Almond removes the hepatic and splenic pains and their obstructions and also removes obstructions of peripheral vessels.¹²

Skin:

Paste of bitter almond root effective for treatment of Melasma, hyper pigmentation, freckles and improve glow and fairness of skin also decoction of its root cures pityriasis. Bitter almond with honey used for treatment of urticaria and wound healing. *Badam talkh* (*Prunus amygdalus Batsch*) mixed with vinegar and rogan-e-gul (rose oil) useful for chronic wound, ulcers and also act as antidote for dog bite. badam talkh (*Prunus amygdalus Batsch*) mixed with vinegar used locally for treatment of headache, chronic wound, ulcers, ring worm, dry and wet itching, herpes zoster, acne, tinea, scabies, hikka, seborrheic dermatitis. Made liniment of badam talkh (*Prunus amygdalus Batsch*) uses for melasma, hyperpigmentation, freckles, and skin cracks due to cold.^{12,17,25}

Anti-fungal activity:

The study conducted by Geng H demonstrated that bitter almond essential oil (BAEO) has 21 different components which is benzaldehyde (62.52%), benzoic acid (14.80%), and hexadecane (3.97%) were the most abundant components analysed by GC-MS. In vivo and vitro study shows vitro and in vivo antifungal activities of BAEO against common plant pathogenic fungi (*Alternaria brassicae* and *Alternaria solani*) can be demonstrated by the mycelium linear growth rate method and pot test, respectively. The in vivo antifungal activity of BAEO against

Gloeosporium orbiculare was much higher than Blumeria graminis also against Gloeosporium orbiculare. The above results indicated that BAEO has the great potential to be developed as a botanical and agricultural fungicide.³³

Other uses:

Local applications of almond oil are effective in *Sud'a* (headache), *Warm-e- Tashannuj* (spasm), meningitis, pneumonia and insomnia. It is also effective in otalgia, tinnitus, mastitis, and gout. Almond oil with hot water is used to relieve sore throat; powder of almond with *Kateera* (*Astragalus gummifer*) is effective in dry cough. According to *Ibn Sina*, almond oil is the best remedy for renal pain, dysuria, renal & urinary bladder stone and hysteria.¹²

Toxicity:

Bitter almonds yield 4-9 mg of hydrogen cyanide per almond. Badam talkh is due its contents cyanogenic diglucoside amygdalin after metabolisation that yields hydrogen cyanide in the body. After ingestion of 6 to 10 may cause serious poisoning and 50 can kill a man. The binding of cyanide ions on cytochrome oxidase lead to a non hypoxemic hypoxia by blocking the cellular respiratory chain. Bitter almonds contain up to 5.3% amygdalin. The toxicity of amygdalin is directly attributable to the release of hydrogen cyanide through the action of enzymes (hydrolase). Hydrolysis is fast in alkaline conditions but slow in acidic ones. Toxic action is an on specific inhibition of many enzyme (mitochondrial cytochrome oxidase), nearly impairment of calcium homeostasis and intra cellular peroxidation of nerve membranes. Accordingly, clinical manifestations of acute cyanide poisoning are often nonspecific and mainly reflect oxygen deprivation of heart and brain such as confusion, dizziness, and the cardio-respiratory collapse in severe poisoning case, neurological manifestations are Dizziness and confusion at first and complicated later by seizures and coma. The diagnosis can be done by the characteristic bitter almond odor of the breath or the gastric lavage. It may be confirmed by the measure of cyanide in plasma.^{20,21}

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