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"*KAIPHAL*" (*MYRICA NAGI* THUNB.), A VERSATILE MEDICINAL PLANT WITH ITS PHYTOCHEMISTRY, PHARMACOLOGY AND TRADITIONAL USES: A COMPENDIOUS REVIEW

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ABSTRACT

Myrica nagi also known as *Myrica esculenta* Buch is an evergreen plant of Myricaceae family. It is widely used medicinal plant in Unani Medicine with common names such as kaiphal, Ood al-Barq and Daa'rshishan. It is rich sources of myricetin which occurs in the bark in the form of the glycoside. In Unani Medicine, plant bark and its root has been used in upper respitatory tract infections and musculoskeleton disorder like Gout and other inflammatory conditions, whereas, its flowers is used to treat Wajaul uzn (Earache), Ishaal (purgation) and Falij (paralysis). It is also documented as Muhallil (Resolvent), Muhallil-e-Riyah (Anti flatulent), Mufatteh (Deobstruent), Qabiz (Constipative), Muqawwi-e-Aasaab (Nervine Tonic), Habis-al-Sailanaat (Dries up secretions), Muqawwi-e-Lissa (Strengthen Gum), Habis-ud-Dam (Haemostatic) and therapeutically used in Istirkha-al-Asab (Atony of the nerve), Bakhrul Anaf (Ozena), Qurooh-e-Afoonia (Putrid ulcers), Qulaa-e-Dahan (Stomatitis), Amraaz-e-Dandaan (Dental diseases), Nazf-ud-Dam (Haemoptysis), Nafkh-e-Shikam (Flatulence), Usr-e-Baul (Dysuria) and Qurooh-e-Zakar (Penile Ulcers). Various pharmacological studies have been accounted on this valuble plant through different models. The aim of this review article is to summarize the significant and appropriate information available on conventional uses, its phytoconstituents and ethno-pharmacological studies carried out so far and to give prominence for conducting further research activities with a scope of its medicinal and therapeutic potential in traditional field.

KEYWORDS: Kaiphal (*Myrica nagi* Thunb.), Ethnomedicinal uses, Pharmacological activities, Unani drug.

INTRODUCTION

Myrica nagi Thunb., belongs to Genus Myrica, which is a large group comprising of more than 97 species in the Myricaceae family. This family contains woody plants native to the subtropical and temperate zones of the earth.[50] Usage of medicinal plant for treatment has increased recently, considering their minimal side effects, thus, promotes usage of plant products world wide. According to WHO around 21,000 plant species have the potential, of being used as medicine. *Myrica nagi* is used in both Unani and Ayurvedic System of Medicines for curing various diseases.[15] It also known as *Myrica esculenta* with common names such as, Kaiphal, Ood al-Barq and Daa'rshishan.[4,10,12,16] Traditionally, its bark, roots and leaves are used for the treatment of various ailments and disorders.[19,45] However, in Unani Medicine mostly plant bark is used.[4,6,10,12,13] It is an evergreen plant of the sub-tropical Himalayas ascending at an altitude of 900-2,100m.[9,18], abundantly found at North-West Forest province, Simla, Sylhet and Southwards to Singapore.[8,18,25] In Unani Medicine, it is recommended to use in Qulaa'-e-Dahan (Stomatitis), Istirkha-al-Asab (Atony of the Nerve), Nazf-ud-Dam (Haemoptysis), Bakhrul Anaf (Ozena) etc. It also improves Asthma and Chronic Cough as it possesses bronchodilatory activity.[37] The major phytoconstituents of this plant are myricetin, myricitrin and quercetin.[4] The bark also contains tannin, saccharine matter and salt.[25] Apart from the various significant studies done so far, still this plant has its own competence to be explored further for its rich medicinal value as an aim and to conduct further studies to validate its therapeutic potential.

TAXONOMY

Classification from Kingdom down to species of *Myrica nagi* Thunb.[4,18]

Kingdom	**Plantae**
Subkingdom	Tracheobionta (Vascular Plants)
Superdivision	Spermatophyta (Seed Plants)
Division	Magnoliophyta (Flowering Plants)
Class	Magnoliopsida (Dicotyledons)
Subclass	Hamamelididae
Order	Myricales
Family	Myricaceae-Bayberry family
Genus	Myrica L.-sweetgale
Species	*Myrica nagi* Thunb.

Fig 1: *Myrica nagi* Stem bark.

Fig 2: *Myrica nagi* Bark Powder.

Fig 3: *Myrica nagi* Fruits.

Fig 4: *Myrica nagi* Whole plant.

SYNONYMS

- M. *esculenta* Buch[4,5]
- M. *farquhariana* Wall[4,5]
- M.*sapida* Wall[5,18,25]
- M.*cerifera*[5,18,25]

VERNACULAR NAMES[4,5,8,9,10,12,13,18,25]

Arabic: Ood-al-Barq, Azuri, Audul, Qandol, Udulish.
Bengali: Kaiphal, Katphal, Satsarila.
Bombay: Kaiphal, Kayaphul, Kayaphala.
Chinese: Yang Mei
English: Box Myrtle, Bay-berry.
Gujrati: Kari-phal
Hindi: Kaiphal, Kayaphul, Kaephal
Kannad: Kirishivani, Kaiphal, Katphal
Kumaon: Kaphal
Marathi: Kayaphala
Malayalam: Maruta, Marutamtoli
Nepal: Kobusi
North West Province: Kaiphal, Kaphal, Karphal
Persian: Kandula, Kaiphal
Punjabi: Kaiphal, Kahela, Kahi, Kaphel
Sanskrit: Katphala, Kumbhi, Kaidaryama, Aranya, Bhadra, Bhadranjaka, Bhadravati, Kayaphala
Sind: Kaephal, Kaiphal
Tamil: Marudam-pattai
Telgu: Kaidaryamu
Urdu: Kaiphal

HABITAT AND DISTRIBUTION

It is a plant of the sub-tropical Himalayas at an altitude of 900-2,100m.[4] abundantly found at North-West Forest province, Simla, Sylhet and Southwards to Singapore.

Also found in the Khasia Mountains and the hills of Burma. It is very commonly cultivated tree in China and Japan.[4,8,10]

BOTANICAL DESCRIPTION

It is a small or moderate sized evergreen tree, 3-15 m in height. The bark is grey or brownish grey, rough with deep vertical wrinkles.[4] The plant bark is externally scabrous, pitted from the separation of pieces of suber of a mottled rusty brown and dirty white colour, suber warty; substance of bark and inner surface of a deep dull red colour.[9] Leaves are lanceolate, oblong-obovate[4] narrowed at both ends, entire, glabrous when mature, coriaceous, dotted beneath with minute resinous dots, petiole 7.5-15 mm long. Male spikes 7.5 mm long, arranged racemosely on a common axillary stalk 2.5-7.5 cm long, bracts orbicular. Female spikes are axillary and erect.[4,18] Flower minute, uni-sexual and in axillary spikes. Fruits an ellipsoid or ovoid drupe of the size of cherry, tubercled, reddish or cheese coloured when ripe are edible, have sourish sweet taste.[4]

MORPHOLOGY

MACROSCOPIC

Bark occurs in pieces of varying sizes, 1.0-2.5cm long, 3-5 cm board and 1-2.5 cm thick. Outer surface is lenticellate, fissured longitudinally and transversely. Inner surface smooth, brownish (tan coloured), outer ends uneven, margin slightly curved towards inside, with pleasant odour, bitter and acrid taste. Fractures hard and brittle.[5]

MICROSCOPIC: Within the suberous layer is a remarkable stratum of stony cells, the parenchyma throughout is loaded with red colouring matter and permeated by large laticiferous vessels from which gummy latex exudes when the bark is soaked in water.[9] Phellem consists of 10-15 layers of cork cells, which are rectangular, tangentially elongated and filled with brown colouring substances. The brown substances give positive test for tannins. Phellogen is 5-6 layers in thickness; the cells are thin-walled and rectangular. Phelloderm consists of 10-20 layers of cells in thickness. The cells are rectangular to polygonal in shape and are completely filled with tannin. Solitary stone cells are abundant in the cork and phelloderm. Phloem consists of phloem parenchyma, companion cells and sieve tubes. Phloem parenchyma cells are round to polygonal in shape and are filled completely with tannin. In the phloem region, certain cells are filled with yellow oily content. Occasional presence of stone cells is also observed in the phloem region. Large laticiferous cells are present in the secondary phloem. Medullary rays are rare. Stone cells present in the cork region, phelloderm and secondary phloem regions are polygonal, lignified and are of varying sizes with narrow lumen. Simple and compound starch grains are also present in the phloem region.[5]

PARTS USED: Bark.[5,10,12,13]
Flowers.[16]
Seeds, Arillus and Fruits.[25]

TASTE OF DRUG (BARK)

Hirreef (Pungent).[6]
Hirreef aur Kasela (Pungent and Astringent).[5,10]

MIJAZ (TEMPERAMENT)

BARK

Hot 1^o Dry 2^0 Ultimate.[10,13]
Hot 1^o Dry 2^0.[12]
Hot 1^o Dry 2^0 deviated towards Dry 3^0.[6]

FLOWER

Hot 2^o Dry 2^0.[6,10]

PERIOD OF OCCURRENCE, COLLECTION, PRESERVATION AND STORAGE

The plant can be grown from late winter to mid summer and should be collected after flowering in the winter season. Sun dried bark is stored in air-tight, moisture free containers.[5]

MIQDAAR E-KHURAAQ (DOSE)

- 60 grains (decoction).[9]
- 3 to 5 gm.[6]
- 3 to 7 gm.[10]
- 3.5 to 7 gm.[17]
- 7-10 gm.[5]

MUZIR ASRAAT (TOXICITY OR ADVERSE EFFECTS)

Harmful for Liver, Spleen and produce dryness in Nerves.[6,10]

MUSLEH (CORRECTIVE)

Doqo (*Peucedanum graveolens* Linn.).[6,10]
Mastagi (*Pistacia lentiscus* Linn), Kateera (*Astragalus gummifer* Linn.) & Gum Acacia (*Acacia arabica* Willd.).[10]
Mastagi for Spleen, Gum Acacia for Nerves and Doqo with Mastagi (*Pistacia lentiscus* Linn.) for liver is prescribed as corrective.[5]

BADAL (SUBTITUTES)

Asaroon (*Asarum europaeum* Linn.) in equal weight, Darunaj Aqrabi (*Dornoicum hookeri* clarke) in half weight and Zarawand Mudharaj (*Aristolochia rotunda* Linn.) in 2/3 of weight for the treatment of Istirkha-al-Asab (Atony of the Nerve) is recommended.[5,6,12,13]

COMPOUND FORMULATION

Raughan-e-Qundul, Habb-e-Mubarak Jadeed.[5]

PHYTOCHEMISTRY

The bark of *Myrica nagi* contains 14% tannin, which gives a purplish colour with ferric salts but the tincture and decoction give a greenish colour owing to the presence of colouring matter in the bark. The ash of the

air dried bark amounts to 7.17%. When the bark is exhausted by water and the water evaporated, a brittle shining extract is obtained of a reddish brown colour, which contains 60% of tannin with some saccharine matter and salts.[9] The yellow colouring matter, myricetin (hexahydroxy flavones $C_{13}H_{18}O_6$, m.p. 350^0-57^o) and myricitrin (myricetin 3-rhamnoside $C_{31}H_{20}O_{12}$, m.p. 99-200^o) occurs in the bark in the form of the glycoside.[5,25] A second glycoside, the aglycone is possibly quercetin is present in traces.[6]

CHEMICAL CONSTITUENTS

Organic: Glycosides, tannins, flavonoids, reducing sugars, resins, steroids, proteins/amino acids are present.[5,25]

Inorganic: Potassium, Calcium, Iron, Zinc, Chloride and Phosphate (Anonymous, 1987) are found. In M. *esculenta* bark, gallic acid; epigallocatechin 3-O-gallate; epigallocatechin-(4β→8)-epigallocatechin3-O-gallate;3-O-galloyl-epigallocatechin-(4β→8)-epigalloc-atechin3-O-gallate along with the hydrolyzable tannin castalagin are present.[44,46]

AFAAL WA KHAWAS (PHARMACOLOGICAL ACTIONS)

- Muhallil (Resolvent).[4,5,6,9]
- Qabiz (Constipative).[5,6,12,13]
- Muhallil-e-Riyah (Carminative/Anti flatulent).[4,6,9]
- Mufatteh (Deobstruent).[10,16]
- Habis-al-Sailana't (Dries up secretions).[10,13,16]
- Mujaffif-e-Qurooh (Ulcer healer).[10]
- Musleh Afoonat (Antiseptic/Checks putrefection).[4,9,13,25]
- Mujaffif-e-Rutubat (Astringent/Dessicant).[4,5,9,13,25]
- Habis-ud-Dam (Haemostatic).[5,13]
- Muhafiz-e-Dandaan (Tooth protective).[10,12]
- Dafi'-e-ta'affun (Antiseptic).[6]
- Muqawwi-e-Asnaan-wa-Lissa (Teeth & Gum strengthener).[6,16]
- Muqawwi-e-Masana (Tonic for Urinary Bladder).[10,12,16]
- Musqit-e- Janeen (Abortificient).[10,12,16]
- Mudir-e-Tams (Emmenagogue).[6,10]
- Muqawwi-e-Aasaab (nervine Tonic).[5,10,12]
- Ma'n-e-Nazlat (Anticatarrhal).[5]
- Mudir-e-Baul (Diuretic).[10]
- Muqawwi (Tonic).[4,9,25]

MAWAQ-E- ISTEMA'L (THEREPEUTIC USES)

- Istirkha-al-Asab (Atony of the nerve).[13,16]
- Amraaz-e-Dandaan (Dental diseases).[10,13,16]
- Waja-ul-Asnaan (Toothache).[10,16]
- Qulaa'-e-Dahan (Stomatitis).[10,13,16]
- Bakhrul Anaf (Ozena).[6,10,13]
- Bakhr-ul-Fam (Bad Odour).[10,16]
- Qurooh-e-Afoonia (Putrid ulcers).[10,13]
- Qurooh-e-Zakar (Penile Ulcers).[10,13]
- Busoor-e- Jild (Pustules).[6,10]
- Nzf-ud-Dam (Haemoptysis).[6,10,12,13]
- Sual-e-Daiyma (Chronic Cough).[5,10]
- Jarayaan-ud-Dam (Haemorrhage).[6,10]
- Nafkh-e-Shikam (Flatulence).[6,13]
- Usr-e- Baul (Dysuria).[6,10,12,13]
- Jarayaan-e-Mani (Spermatorrhoea).[10]
- Bawaseer (Piles).[10]
- Waja-ul-Uzn (Otalgia).[5,10]
- Zeequn Nafas (Asthma).[5]

ETHNOMEDICINAL USES

- A decoction of the bark mixed with ginger and cinnamon is valuable in phthisis, fevers, lung infections, typhoid, dysentery and diuresis.[25]
- A compound powder formulation known as Katphaladi Churna, consisting of the bark of *Myrica nagi*, tuber of *Cyperus rotundus*, root of *Picrorrhiza kurroa*, *Curcuma zedoaria*, *Rhus succedanea* and *Aplotaxis auriculata* in equal parts is given in doses of about a drachm with the addition of ginger juice and honey in throat infection, cough, chronic bronchitis, catarrhal fever, scrofulous, aphthous affection and asthma.[9,25]
- Its bark powder along with vinegar is applied to strengthen the gums and to relieve tooth aches. Oil prepared from the bark is dropped into the ears in earache. Pessaries made of the bark are used to promote the menses (Uterine action). Powder or the lotion of bark is used for washing putrid sores.[5,9,25]
- With catechu, asafoetida and camphor, a paste of it is applied over piles with benefit. Arillus is used as an ingredient in numerous carminative mixtures. Fruits when boiled yield a kind of wax called myrtle wax which is used as a healing application to ulcers.[25]

PHARMACOLOGICAL STUDIES

Various revisions to find out new entity/ies have been taken place on this plant through documented validation and pre-clinical screening of its various parts either in the form of aqeuous, methanolic, crude extracts or *in vitro* (studies with or within an entire living organism) and *in vivo* (outside of a living organism) studies in animals models on scientific parameters to find out its biological activities.

The following pharmacological studies on various parts have been done.

- Analgesic activity.[23,28,36]
- Antiasthmatic activity.[35,37]
- Anticancer activity.[21,40]
- Antidepressant activity [49]
- Antidiabetic activity.[39]
- Antihelmintic action.[14,34]
- Antihypertensive activity.[27]
- Antiinflammatory activity.[2,23,41]
- Antimicrobial activity.[2,21,28]
- Antipyretic effect.[28]
- Antiulcer effect.[48]
- Anxiolytic activity.[3,17]
- Chemopreventive activity.[3,38]

- Hepatoprotective activity.[42]
- Wound healing activity.[26]
- Anti-allergic action.[2,34,35]
- Cell reinforcement movement/Antioxidant activity.[7,22,24]
- Toxicological studies.[32,39]

DISCUSSION AND CONCLUSION

As evident through the review, Kaiphal *(Myrica nagi* Thunb.) has been used for its restorative and medicinal potentials, from the traditional Unani array of solution. It is an influential medicinal herb in Unani system of medicines and being use since time immorial, because of its safety and cost effective approach. Worthwhile, it is used in the prophylaxis of diverse disorders. It is clear in this review that this drug contains various phytochemicals, which are responsible for the therapeutic estimation of this plant. It has been responsible for several pharmacological impacts in the treatment of various diseases, including asthma, cough, diabetes, ulcer etc. The bark of this plant is efficacious in Waja-ul-Dandan, Stomatitis, Putrid ulcers, Ozena, Chronic cough and Earache. It was observed that bark (Powder) beneficial in healing penile and other ulcers and also Busoor-e-Jild (Pustules). Through, the literature survey, it was found that various activities of bark, leaves and fruits also have been studied earlier, but not much work is done on physiochemical evaluation and phytochemical screening of leaves and fruits. Besides bark, fruits, flowers and other parts of tree need further exploration on its pharmacological potential in future through various aspects of research. Efforts should be made to standardize a technique for utilization of all the parts which will lead to its wider commercial applicability. Further, there are many analyses of chemical constituents, and the pharmacological activity has been reported for this plant, the mechanism of pharmacological action and the metabolites responsible for these activities should be studied in more detail.

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