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Review Article

PHYTOCHEMICAL AND PHARMACOLOGICAL STUDIES AND EVIDENCE-BASED INDICATIONS OF *BABUNA* (*MATRICARIA CHAMOMILLA* L.): A REVIEW

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ABSTRACT

Babuna (Matricaria chamomilla L.syn. *Matricaria recutita* or *Chamomilla recutita* L.) is a well known medicinal plant used in Unani System of Medicine since centuries. It belongs to the family Asteraceae. Detailed description of this herb is found in classical literature of Unani Medicine. *Babuna* has been used for various therapeutic, cosmetic and nutritional purposes since centuries which have been proved through its traditional use and scientific research. Variety of pharmacological actions of *Babuna* such as *Muhallil* (resolvent), *Musakkin-e-Alam* (Analgesic), *Mudir al Bawl* (Diuretic), *Mudir Hayd* (Emmenogogue), *Muarriq* (Diaphoretic), Muqawwi Mida (Stomachic), *Kasir-i-Riyah* (Carminative), *Muqawwi-i- Dimaag* (Brain Tonic), *Muqawwi-i-Asab* (nervine tonic) etc., have been mentioned in classical books of Unani System of Medicine. Various phytochemical studies have shown presence of different types of bioactive constituents in this herb which on further experiments and clinical studies have shown multiple pharmacological properties which are in consonance with the actions documented in Unani literature. The present article has provided a review of pharmacological actions and therapeutic uses of *Babuna* in Unani Medicine, in the light of knowledge present in Unani literature as well as recent scientific studies and experimental data available on *Matricaria chamomilla*.

INTRODUCTION

Herbs have been in use, dating back at least 5000 years, in both traditional and non-traditional forms of medicine.[1-4] The enduring popularity of herbal medicines has been described through the elimination of the root cause of the ailments with minimal toxic side effects. *Babuna* is one of most widely used, oldest, and well known medicinal plants in the world and it has been recommended for a variety of healing applications since ages.[5] *Babuna* is an important medicinal and aromatic herb. It is a member of the daisy family i.e., Asteraceae or Compositae, and indigenous to southern and eastern Europe.

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Babuna is also cultivated in France, Germany, Hungary, Russia, Yugoslavia, and Brazil. In India, it was introduced during the advent of Mughals. Now it is also grown in Punjab, Uttar Pradesh, Maharashtra, and Jammu, and Kashmir.

"Chamomile" stands for the "ground apple" in Greek, probably because of its apple-like fragrance. It is also synonym to wealth, harmony, love, tranquility and purification. Aromatherapy of Babuna helps to reduce anxiety and insomnia. The smell has been shown to have soothing effects.[6] *Babuna* has been used in herbal remedies for thousands of years, known in ancient Egypt, Greece, and Rome.[7] *Babuna* has also been described by Hippocrates as a medicinal plant and Galen and Asclepiades used to prescribed chamomile tea as a calming beverage.[8] Mathiolus has mentioned chamomile in Latin herbarium.[9] where he has enlisted the chamomile essential oil as a medication against spasms.

Leaves, flowers, stems and roots of Chamomile plant are used for various therapeutic purposes. In Unani medicine its flowers are called *Gul-e-Babuna*

which are widely used for various therapeutic purposes. Flowers and flower heads are natural source of blue oil (essential oil). The flowers of *M. chamomilla* contain the blue essential oil from 0.2 to 1.9%,[10,11] which finds a variety of uses in various pharmaceutical preparations, in cosmetics as well as in aromatherapy. 26 countries around the globe have included *Babuna* in their pharmacopoeia.[12] It is an important constituent of several Unani, Ayurvedic and Homeopathic medicinal preparations.[11,13-15]

Scientific Classification

[United States Department of Agriculture (USDA)][16]

Table 1: Botanical Classification of *Babuna*

Rank	Scientific and Common Names
Kingdom	*Plantae*- Plants
Sub-kingdom	*Tracheobionta*- Vascular plants
Superdivision	*Spermatophyta*- Seed plants
Division	*Magnoliophyta*- Flowering plants
Class	*Magnoliopsida*- Dicotyledons
Subclass	*Asteridae*
Order	*Asterales*
Family	*Asteraceae / Compositae* - Aster family
Genus	*Matricaria* L. - Mayweed
Species	*Matricaria recutita* L.- German chamomile

Vernacular Names

Table 2: Vernacular Names of *Babuna*

Arabic name: *Baaboonaj*[17,18], *Baboonak, Baboonaq, Zahar al mulk, Habq al baqar, Sakar, rajul ar rijaj*[18]
Bengali name: *Babunphul*
English name: Common chamomile[19], German chamomile[19], Earth apple, Ground apple, Whig plant, Manzanilla
Hindi name: *Sonbhal*[18], *Sona moti*[17,18]
Kannada name: *Shime shavantige*
Marathi name: *Babuna*
Persian name: *Baaboona* or *Babuna*[18,20], *Babun*, *Karnanak*[18]
Urdu name: *Babuna*
Egyptian name: *Karkaash*[18]

Botanical Description

Babuna is an annual plant with thin spindle-shaped roots which penetrate into the soil flatly. The stem is branched, erect, ramified, and extends to a height of 10–80cm. The leaves are long and narrow, bi- to tripinnate. The flower heads are separately placed, pedunculate and heterogamous, having a diameter of 10–30mm. The florets are tubular and golden yellow with 5 teeth (1.5–2.5mm long) ending always in a glandulous tube. The flowers are arranged concentrically and 6–11mm long, 3.5mm wide in size. The receptacle is 6-8mm broad and flat in the beginning and conical at the end. It is hollow and without paleae. The fruit is yellowish brown achene.

The true chamomile i.e. M. *chamomilla* is very often mystified with plants of the genera *Anthemis.* The three plants viz. *A. nobilis* Linn, *Corchorus depressus* Linn, and *M. chamomilla* Linn. are mentioned under one name *Babuna* at different places in the classical literature of Unani Medicine. It created a lot of misunderstanding and misuse of the drug as an adulterant. A detailed taxonomic and anatomical study was conducted by Ghauri *et al*. and concluded that *Babuna*, which is mentioned in Unani texts belongs to the family Compositae (Asteraceae) and that the correct botanical name of *Babuna* is *M. chamomilla* L.[21]

Figure 1: *Matricaria chamomilla*

Morphology:[22,23,24]

Stem: Erect, heavily ramified.

Height: 10 to 80 cm.

Color: Downy, grayish green in color.

Leaves: Long and narrow.

Flower: Diameter - 10 to 30mm

Color: Golden yellow, white flower.

Fruit: Yellowish brown acne.

Chemical /Bioactive Constituents

Variety of biologically active constituents are found in *Babuna*, which are used in various medicinal and cosmetics preparations. The essential oil extracted from flowers of German chamomile is called blue oil. The percentage of blue essential oil in the flowers of M. *Chamomilla* is from 0.2 to 1.9%.[10,11]

Till the date more than 120 chemical constituents have been recognized in chamomile flower [25,26] including 28 terpenoids, 36 flavonoids[27-29] and 52 additional compounds with potential pharmacological activity.The principal components of the essential oil extracted from the flowers are the terpenoids α-bisabolol and its oxides and azulenes, including chamazulene, chamazulene carboxylic acid and proazulenes[30-35]. Chamzulene is produced by the degradation of proazulenic sesquiterpene lactones and matricin and posses anti-inflammatory property. Other principle constituents are Phenolic compounds, primarily the flavonoids apigenin, quercetin, patuletin as glucosides and various acetylated derivatives.[36] Apigenin is the most important compound among flavonoids.

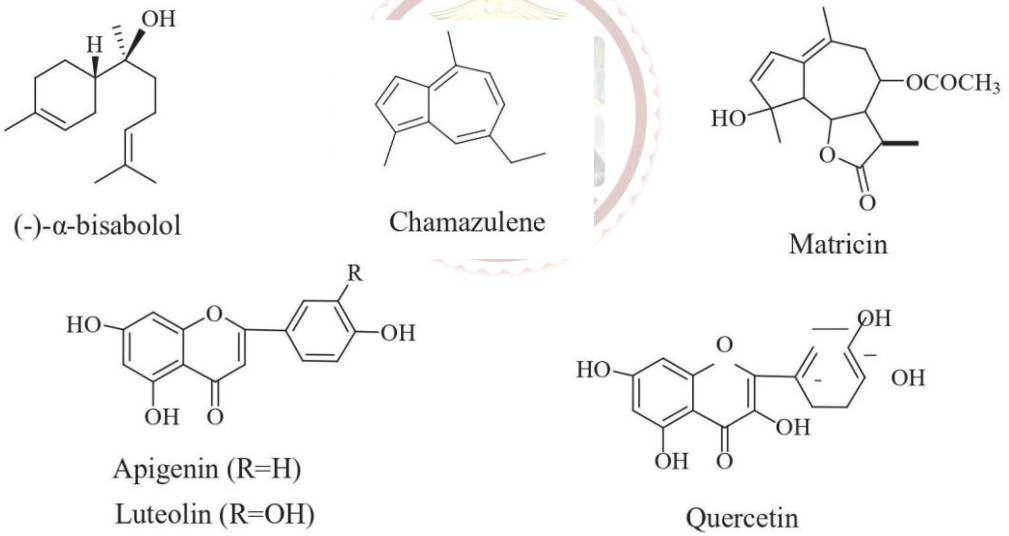

Figure 2: Secondary Metabolites from M. *Chamomilla*

Traditional Uses

Babuna is used for its potent anti-inflammatory, analgesic, antiseptic, antispasmodic, carminative and mild sudorific.[37] Externally, the application of the powdered drug may be used to heal wounds. It is also used for shingles, boils, inflammation of the mouth, throat, and eyes as well as for hemorrhoids.[38] Traditionally, *Babuna* has been in use for centuries as an antioxidant, anti-inflammatory, mild astringent and healing herb.[39]

It is also used to treat piles, canker sores ulcers, wounds, skin irritations, eczema, gout, bruises, burns, , neuralgia, sciatica, rheumatic pain, mastitis and other ailments.[40,41] It is externally used for the ophthalmic disorders such as blocked tear ducts, conjunctivitis, nasal inflammation as well as in chicken pox, diaper rash, cracked nipples etc.[42,43]

Description of Drug in Unani Literature

The three plants viz. *A. nobilis* Linn, *Corchorus depressus* Linn, and *M. chamomilla* Linn. are mentioned under one name *Babuna* at different places in the classical literature of Unani Medicine. It created a lot of misunderstanding and misuse of the drug as an

adulterant. A detailed taxonomic and anatomical study was conducted by Ghauri *et al*. and concluded that *Babuna*, which is mentioned in Unani texts belongs to the family Compositae (Asteraceae) and that the correct botanical name of *Babuna* is *M. chamomilla* L.[21]

In ancient Iraq-Arab there was a village named *Babuna* where this herb was found growing in abundance due to which it was named as *Babuna*.[17] Though Hippocrates was not fully aware of the therapeutic properties of this herb but Galen and Dioscorides used to prescribe this drug for fevers.[17]

Part Used (*Hissa Mustamela*)

Flowers, Leaves and Root.[18]

Temperament (*Mizaj*)

Hot 2 and Dry 1[20], Hot 3 and Dry 2[44]

Pharmacological Actions as per Unani Medicine (*Afa'al*)

Table 3: Pharmacological Actions of *Babuna*

S. No.	Pharmacological Actions	References
1.	*Muhallil* (Resolvent)	[17,18,20,44,45]
2.	*Musakkin-e-Alam* (Analgesic)	[17,18,20,44,45]
3.	*Dafi-i-Humma* (Antipyretic)	[17,18,20,45]
4.	*Mufatteh-e-Sudad* (Deobstruent)	[17,18,20,]
5.	*Mudirr-i-Bawl* (Diuretic)	[17,18,20,44,45]
6.	*Mudirr-i- Hayd* (Emmenagogue)	[17,18,20,44,45]
7.	*Mudirr-i-Laban* (Galactagogue)	[17,18,20,44,45]
8.	*Mukhrij-i-Janin wa Masima* (Abortifacient)	[45]
9.	*Mua'rriq* (Diaphoretic)	[17,18,20,44]
10.	*Mulattif* (Demulcent)	[17,18,20]
11.	*Muqawwi Mida* (Stomachic)	[17,45]
12.	*Kasir-i-Riyah* (Carminative)	[17,20,45]
13.	*Muqawwi-i- Dimaag* (Brain Tonic)	[17,18,20,44,45]
14.	*Muqawwi-i-Asab* (Nervine Tonic)	[17,18,20,44,45]
15.	*Muqawwi-i-Baah* (Aphrodisiac)	[17,20]
16.	*Musakkhin* (Calorific)	[17,18]
17.	*Murkhi* (Relaxant)	[17,18]
18.	*Dafi-i-Qulanj* (Antispasmodic)	[17,18,44]
19.	*Mufattit-i-Hasah* (Lithotriptic)	[17,18,20,44]
20.	*Mujaffif-e-Qurooh* (Desiccant Ulcer)	[17,18,20,44]

Uses as per Unani Medicine (Istemal)

Table 4: Uses of *Babuna*

S. No.	Therapeutic Uses	References
1.	*Waja-al-Mafasil* (Arthralgia)	[17]
2.	*Niqris* (Gout)	[17]
3.	*Irq al-Nasa* (Sciatica)	[17]
4.	*Waja' al-Khasira* (Low backache)	[17]
5.	*Du'f al-Dimag* (Cerebro-asthenia)	[17,18,20,44,44]
6.	*Du'f al-Asaab* (Weakness of Nerves)	[17,18,20,44,45]
7.	*Du'f al-Baah* (Loss of libido)	[17,20,45]
8.	*Du'f al-Mi'da* (Weakness of stomach)	[17,45]
9.	*Qilla al-Laban* (Suppressed lactation)	[17,20,44]
10.	*Yaraqaan* (Jaundice)	[17,18,20,44,45]
11.	*Waram-e-Sulbiyya* (Sclerotitis)	[17,18,45]
12.	*Nazla-o-Zukaam* (Coryza & Catarrh)	[17,18,20,44]
13.	*Surfa Yubsiyya* (Dry Cough)	[17,18,44]

14.	*Ihtibas-i-Bawl* (Anuria)	[17,18,20,44,45]
15.	*Ihtibas-i-Haid* (Amenorrhoea)	[17,18,20,44,45]
16.	*Humma* (Fever)	[17,18,20]
17.	*Suda* (Headache)	[17,18,20,44]
18.	*Waja' al-Udhun* (Otalgia)	[17,44]
19.	Deafness (Impaired Hearing)	[17,18]
20.	Conjuctivitis (Ashob-i- Chasm)	[17,18]
21.	*Hasah al-Kulya wa-Masana* (Renal and Urinary Bladder Stones)	[17,18,20,44]
22.	*Qulanj* (Colics)	[17,18,44,45]
23.	*Usr al-Wilada* (Difficult labour/dystocia)	[17,18,20,44,44]
24.	*Qula* (Stomatitis)	[17,18,20,44]
25.	*Waram al-Khusyatayn* (Orchitis)	[17,20]
26.	*Ishaal* (Diarrhea)	[17]
27.	Eczema (*Hikka*)	[17,18,20]
28.	*Waram al-Maq'ad* (Proctitis)	[20]

Dose (Therapeutic Dose)

1-3gm,[20,45] 4gm[44]

Adverse Effects (*Muzir*)

Injurious to Throat (*Halaq*)[17,20,45]

***Musleh* (Corrective)**

Shahad Khalis,[17,20,45] *Sharbat Anar*,[17,20] *Roghan Gul*,[17] and *Gule Nilofar*[44]

Substitute (*Badal*)

Kaisoom,[17,20] *Brinjasaf*,[17,20,45] *Aqhawan*[17,20]

Compound Formulations in Unani Medicine (*Murakkabat*)

Jawarish Babuna,[45] *Roghan Babuna*,[45] *Majoon Flasfa*,[45] *Zamad Muhallil*[45]

Evidence Based Pharmacological Activities and Indications

Anti-inflammatory and anti-phlogistic properties

Gul-e-Babuna (flowers of chamomile) contain 1–2% volatile oils including alpha-bisabolol, alphabisabololoxides A & B, and matricin (usually converted to chamazulene and other flavonoids) which possess anti-inflammatory and antiphlogistic properties.[46-49] Studies have proved that anti-inflammatory activity of chamomile are due to the inhibition of LPS-induced prostaglandin E(2) release and attenuation of cyclooxygenase (COX-2) enzyme activity without affecting the constitutive form, COX-1.[50,51]

Anti-cancer Activity

Studies with apigenin which is one of the bioactive constituents of chamomile have shown promising growth inhibitory effects on preclinical models of skin, prostate, breast and ovarian cancer.[52-56] Chamomile extracts has also shown apoptosis in cancer cells but not in normal cells in similar doses.[57] Recently tested novel agent TBS-101 which is a mixture of seven standardized herbal extracts including chamomile, proved to have significant anticancer activities against androgen-refractory human prostate cancer PC-3 cells, both *in vitro* and *in vivo* situations.[58]

Common cold

Acute viral nasopharyngitis which is also called Common cold is one of the most common human diseases. It is an infectious disease of the upper respiratory system. Common cold is not life threatening usually, although its complications like pneumonia may lead to death, if not properly treated. Studies have indicated that inhaling the steam of chamomile extract proved very helpful in coping up with the symptoms of common cold.[59] However, further research is needed to confirm these findings.

Colic/Diarrhea conditions

An apple pectin-chamomile extract was found to be effective in diarrhea in children.[60] Chamomile tea combined with other herbs such as fennel, licorice etc. was also found to be effective in case of infantile colic.[61]

Eczema

External application of chamomile extract has been found to be 60% as effective as 0.25% hydrocortisone cream.[62,63]

Gastrointestinal Conditions

The anti-ulcerogenic effect have been shown by the commercial preparations (STW5, Iberogast), containing flower extract of Chamomile. There was also reduction in acid output and increase in mucin secretion and prostaglandin E (2) release.[64]

Hemorrhoids

Studies have suggested that application of chamomile ointment and Sitz bath with chamomile tincture may reduce inflammation associated with hemorrhoids.[65,66]

Mucositis

In a study, involving 36 patients, diagnosed with recurrent apthous ulcer (RAS) at Department of Oral Medicine, Mashhad University of Medical Sciences. The patients were randomly divided into group A and B. The intervention group A, receiving chamomile mouth rinse showed significant reduction in pain and burning sensation in the subsequent visits while the control group B received placebo rinse.[67]

Osteoporosis

Chamomile extract has been shown to stimulate mineralization and differentiation of osteoblastic cells in sufferers of osteoporosis. It exhibit anti-estrogenic effect thus suggesting an estrogen receptor related mechanism.[68] However for clinical use, further studies are needed.

Sleep aid/Sedation

Calming effects of tea of chamomile and essential oil aromatherapy have been used to induce sedation and for insomnia. Tranquilizing properties of chamomile are due to flavonoid apigenin which binds to benzodiazepine receptors in the brain.[69] [70]

Anxiety and Seizure

Studies from controlled clinical trials on extract of M. chamomilla extract shows modest anxiolytic activity in patients of mild to moderate generalized anxiety disorder(GAD).[71] Extract also posses effects on picrotoxin induced seizures.[72]

Diabetes

It is also evident from studies that chamomile extract improves hyperglycemia and diabetes mellitus related complications by suppressing blood glucose levels, increasing glycogenesis and inhibiting sorbitol in the human RBCc.[73] Chamomile extract has shown independent insulin secretion activity.[74] It also shows protective effect on pancreatic beta cells in diminishing hyperglycemia-related oxidative stress. [75]

Wound healing

In a trial study on 14 patients of tattoo abrasion wounds, chamomile extract was found to be efficacious in wound healing and speeding up epithelialization.[76] Another study chamomile was found to cause complete wound healing faster than corticosteroids.[77]

CONCLUSION

The present review explores the medicinal importance of *Babuna* as described in Unani texts. Based on these findings, it can be understood that the *Babuna* (*Matricaria chamomilla* Linn.) is effective in treatments of various ailments and recommend that further phytochemical, clinical and advance research should be done on this very promising traditional medicinal plant for the welfare of mankind. Also, in animal and human studies it is found to have various properties but still there is need for further research on untouched medicinal aspect of this herb.

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