

INTERNATIONAL JOURNAL OF UNANI AND INTEGRATIVE MEDICINE



E-ISSN: 2616-4558
P-ISSN: 2616-454X
IJUIM 2020; 4(1): 32-36
Received: 26-11-2019
Accepted: 30-12-2019

Salma Bi
M D Scholar, Department of
Moalijat, Jamia Tibbiya,
Deoband, Saharanpur, Uttar
Pradesh, India.

Jamal Akhtar
Research Officer (U), Central
Council for Research in Unani
Medicine, New Delhi, India.

Fouzia Bashir
Research Associate, Central
Council for Research in Unani
Medicine, New Delhi, India.

Rehana Alvi
Professor, Department of
Moalijat, Jamia Tibbiya,
Deoband, Saharanpur, Uttar
Pradesh, India.

Corresponding Author:
Fouzia Bashir
Research Associate, Central
Council for Research in Unani
Medicine, New Delhi, India.

Pharmacological investigations of Babchi (*Psoralea corylifolia* Linn) – An important drug of Unani system of medicine

Salma Bi, Jamal Akhtar, Fouzia Bashir and Rehana Alvi

Abstract

Babchi (*Psoralea corylifolia* Linn) is an important medicinal plant which is used in Unani System of Medicine since long. Ancient Unani physicians have reported use of Babchi seeds in the treatment of different diseases especially skin diseases e.g. *Bars* (Leucoderma), *Da-us-sadaf* (Psoriasis), *Bahaq* (Pityriasis), *Tap-e Balghamiya* (Phlegmatic Fever), *Deedan-e-Am'aa* (Intestinal worms) and other inflammatory diseases of the skin. Several studies were conducted to validate the therapeutic potentials of the plant and it was observed that besides the aforesaid pharmacological actions, the plant extracts also possesses antibacterial, antitumor, antioxidant, anti-inflammatory, antifungal and immunomodulatory activity. The present paper is an effort to document the pharmacological investigations of Babchi (*Psoralea corylifolia* Linn) with evidence-based approach.

Keywords: Babchi, *Bars*, Unani

Introduction

Plants are used as remedies against various diseases in the Unani and other traditional systems of medicine or in ethno medical practices. They are relatively safe, easily available, and affordable to the masses. During the past few decades, emphasis has been given to validate the efficacy of these drugs in different diseases on modern parameters. Some active compounds isolated from these plants have also been gaining importance because of the vast chemical diversity they offer. This has led to the acceptability and increased demand for herbal medicine in the treatment of different ailments.

Babchi (*Psoralea corylifolia* Linn.) from family Fabaceae is one of the most important drugs of Unani system of Medicine. The plant is of immense biological importance, and it has been widely exploited since ages for its magical effect against several skin diseases such as *Bars* (Leucoderma), *Da-us-sadaf* (Psoriasis), *Juzam* (Leprosy), *Bahaq* (Pityriasis), etc. It is also used for the treatment of *Tap-e Balghamiya* (Phlegmatic Fever), *Deedan-e-Am'aa* (Intestinal worms) and other inflammatory diseases of the skin. Several compound formulations e.g. *Safoof-e-Bars*, *Zamad-e-Bars*, *Roghan-e-Babchi* has babchi as its main constituents [2, 15, 17, 35, 36].

Vernacular names [1, 3-6]

Hindi:	Babachi, Bavanchi, Bhavanj, Bukchi
English:	Babchi Seeds
Persian:	Waghchi, Vabkuchi
Urdu:	Bebechi
Marathi:	Babachi, Bavachya
Punjabi:	Babchi
Gujarati:	Babchi
Bengali:	Bavachi
Telugu:	Bavanchalu, Bhavanchi-vittulu, Bogi-vittulu, Karu-bogi
Kannada:	Bavanchigida, Karbekhiga
Malayalam:	Kapokkari, Kaurkoalari
Oriya:	Bakuchi
Tamil:	Karpokarishi
Sanskrit:	Aindavi, Avalguja, Bakuchi, Kushthahantri, Sashilekha, Shulotkha, Sitavari, Soma
Bangladesh:	Buckidana
Arabic:	Loelab el abid, Mahalep
Srilanka:	Ravoli

Plant description

An erect annual, 30-180 cm. high; stem and branches grooved, studded with conspicuous glands. Leaves are simple, 3.8-7.5 by 2.5-5 cm. broadly elliptic, incise-dentate. Flowers close, in dense axillary, solitary, 10-30 flowered racemes; Corolla bluish purple, standard orbicular, 6 mm. long, clawed. Pods 5 mm long, ovoid-oblong, closely pitted, mucronate, black. Seeds one, smooth, adhering to the pericarp, brownish black in colour, about 2 mm long, oblong and flattened, odourless but on chewing emit a pungent odour, bitter, unpleasant and acrid taste [1, 3, 5]. The plant flowers during rains and seeds mature in November. Under proper care, the plants may continue to grow for 5-7 years [3].

Chemical constituents

Babchi seeds contain an essential oil (0.05%), a non-volatile trepenoid oil, a dark brown resin (8.6%), a brown fixed oil (10%), a pigment called hydroxyflavone, a monotrepenoid phenol named bakuchiol, raffinose and coumarin compounds namely psoralidin, psoralen, isopsoralidin, isopsoralen, and corylifolin, albumin, sugar, ash 7.5% and a trace of manganese [1, 3, 6, 7]. The seeds contain therapeutically active constituents namely Psoralen and isopsoralen [3].

On keeping, fixed oil deposits psoralen, which contains resin acid (21.5%). Stigmasterol is present in the unsaponifiable matter. Essential oil and un-saponified oil are pharmacologically active. They are used in cases of leucoderma and psoriasis [1, 6].

Mizaj (Temperament)

Hot 2⁰ and Dry 2⁰ [1, 2, 6-9]

Parts Used

Leaves, flowers, seeds, root and fruits [1-3, 7, 13]

Afaal (Pharmacological actions)

- *Daf-e-Da-us-Sadaf* (Anti-psoriatic) [1, 3, 7, 13]
- *Daf-e-Bars* (Anti-leucodermic) [2, 5, 6-13]
- *Daf-e-Jozam* (Anti-leprosy) [3, 5, 7, 10, 13, 14]
- *Musaffi-e-Khoon* (Blood Purifier) [2, 5, 6-9, 11]
- *Jali* (Detergent) [2, 6, 8, 10, 11]
- *Daf-e-Kharish* (Anti-pruritic) [5, 8, 10, 12, 14]
- *Mulayyin-e-Am'aa* (Laxative) [1, 3, 5-7, 10-12]
- *Kasir-e-Riyah* (Carminative) [6, 8, 9, 11, 12]
- *Mushtahi* (Appetizer) [5, 10, 12]
- *Muqawwi-e-Meda* (Stomachic) [6, 9-12]
- *Daf-e-Waja-ul-Meda* (Relieves stomach ache) [5, 14]
- *Muhallil-e-Waram* (Anti-inflammatory) [10, 12, 14]
- *Qatil-e-Deedan-e-Amaa* (Anti-helminthic) [1, 3, 5-11, 14]
- *Muqawwi-e-Qalb* (Cardiac Tonic) [5, 10, 12]
- *Daf-e-Tap-e-Balghamiya* (Anti-phlegmatic Fever) [3, 5, 7, 8, 10-12, 14]
- *Mu'arriq wa Mudir-e-Baul* (Diaphoretic and Diuretic) [1, 3, 7]
- *Muharrik wa Muqawwi-e-Bah* (Stimulant and Aphrodisiac) [1, 3, 5, 7, 11, 13, 14]
- *Mus'hil* (Purgative) [2, 5, 14]
- *Daf-e-Diq al Nafs* (Anti-asthmatic) [3, 10-12]
- *Musakkin* (Sedative) [7, 14]
- *Man-e-Jaraseem* (Antibacterial) [1, 3, 14]

Therapeutic Uses

- *Bars* (Leucoderma)

- *Da-us-sadaf* (Psoriasis)
- *Juzam* (Leprosy)
- *Bahaq* (Pityriasis)
- *Jarab* (Scabies)
- *Hikka* (Pruritis)
- *Quba* (Ring worm)
- *Fasad-e-Khoon* (Impurities of Blood) [1-14]
- *Amraz-e-Dam* (Blood Diseases)
- *Amraz-e-Safra* (Bilious Diseases)
- *Tap-e-Balghamiya* (Phlegmatic Fever) [4]
- *Deedan-e-Am'aa* (Intestinal worms)
- *Qarah-e-Atshak* (Syphilitic Ulcer)
- *Surat-e-Inzal* (Premature Ejaculation) [5, 7, 8, 12]

Dosage

Safoof (powder) of Babchi seeds are prescribed for oral administration. Seeds in the dose of 4-6 gm [2-7], 3.5-7.5 gm [11, 12] and *Zulal* (infusion) in the dose of 1.25 Tola should be given [10, 12]. For external topical application, Babchi seeds are prescribed in the form of *Zimad* (paste) and *Marham* (ointment) [2, 3].

Evidence based studies on Babchi (*Psoralea corylifolia* Linn.)**Anti-psoriatic activity**

Babchi has been used in *Da-us-Sadaf* (Psoriasis) by the Unani physicians [1, 3, 7, 13]. Several studies were conducted to evaluate the anti-psoriatic activity and it was found that *zulal* (infusion) of the powder of Babchi seeds along with local application of *Marham-e-Gulabi* is effective in the treatment of *Da-us-Sadaf* (psoriasis) [15].

Another study was conducted to evaluate the percutaneous absorption of five compounds derived from *P. corylifolia*, and to further explore the inhibitory effect on psoriasis-like lesions generated by imiquimod stimulation in a mouse model. 8-MOP, psoralen, isopsoralen, psoralidin, and bakuchiol were comparatively tested for *in vitro* skin permeation, keratinocyte apoptosis, and *in vivo* anti-psoriatic potency. The antiproliferative activity against keratinocytes was stronger for 8-MOP and isopsoralen than the others. Topical application of PUVA by using 8-MOP and isopsoralen on imiquimod-induced plaque significantly reduced transepidermal water loss from 55 to 33 and 38 g/m²/h, respectively. The epidermal thickening elicited by imiquimod (117 μm) was decreased to 62 and 26 μm by 8-MOP and isopsoralen application. IL-6 expression in psoriasisform skin was downregulated by isopsoralen but not 8-MOP. Isopsoralen may be a potential candidate for PUVA therapy [16].

In another study, use of psoralen along with its chemical derivatives, namely, trioxalen, supplemented with exposure to sunlight was found more effective for the treatment of psoriasis [17].

Psoralea corylifolia seed extract showed an overall anti-psoriatic activity of 75.87%, when compared with standard tazarot gel activity 87.94% by using mouse tail model, confirmed its traditional use in psoriasis treatment [25].

The efficacy of Babchi oil (BO) loaded nanostructure gel was evaluated for anti-psoriatic activity and oxidative stress biomarkers assessment using mouse tail model. Evaluation of anti-psoriatic activity revealed two times higher efficacy of BO nanogel in comparison to the native BO gel. Further, significantly enhanced superoxide dismutase (SOD) and

reduced glutathione (GSH) levels, and diminished malondialdehyde (MDA) and nitrite (NO) levels revealed that prepared nanogels played a major role in the management of reactive oxygen species (ROS) associated in psoriasis pathogenesis. Hence, this study provides strong evidence for use of cyclodextrin-based nanogels as a safe and better delivery carrier of BO for the management of psoriasis.²⁶

Ethanol seed extracts exhibited significant effect of anti-psoriatic and anti-bacterial activity. The seed extracts showed significant effect on psoriasis which was concluded by measuring mean thickness of epidermis and histopathological reports and anti-bacterial studies by zones of inhibition and MIC^[27].

Anti-Leucodermic activity

A clinical trial was carried out on the patients having vitiligo by the local application of an Ayurvedic preparation containing *P. corylifolia* as the main ingredient, along with oral administration of *Gandhaka rasayana*. Early cases of vitiligo showed maximum improvement within 1–10 months, whereas chronic cases having vitiligo of lip showed a poor response. Oral administration of 8-methoxypsoralen along with exposure of the patient to sunlight for 5–30 min daily for 1–7 weeks gave very encouraging results. In one study, 49 patients underwent 6 months of *Psoralea corylifolia* treatment. Of these patients, 14% were cured and another 19% regained pigmentation on at least two-thirds of the affected skin^[17].

Anti-inflammatory activity

The *chloroform* extract of seed at a dose of 400 mg/kg is effective against carrageenan induced paw oedema in rat and mouse ear inflammation^[18]. Three flavone derivatives, 7-O-methylcorylifol A, 7-O-isoprenylcorylifol A, and 7-O-isoprenylneobavaisoflavone, having anti-inflammatory activities were isolated from the fruits of *P. corylifolia*^[28].

Neobavaisoflavone is one of the flavonoids found in *Psoralea corylifolia*. Neobavaisoflavone significantly inhibited the production of reactive oxygen species (ROS), reactive nitrogen species (RNS) and cytokines: IL-1 β , IL-6, IL-12p40, IL-12p70, TNF- α in LPS+IFN- γ - or PMA-stimulated RAW264.7 macrophages^[30].

Hepatoprotective activity

The *aqueous* extract of seeds furnished one hepatoprotective compound, bakuchiol, together with two moderately active compounds, bakuchicin and psoralen, on tacrine-induced cytotoxicity in human liver-derived Hep G-2 cells^[19].

Anthelmintic activity

The *alcoholic* extract of seeds of evaluated for anthelmintic activity using two-enzyme system taking rat brain as a model for *Ascaridia galli*^[20].

Neuroprotective activity

It is demonstrated that *P. corylifolia* Linn seed extracts have a significant protective effect against 3-nitropropionic acid induced cytotoxicity. Thus, *P. corylifolia* Linn seed extracts may have potential applications as therapeutic agents for treating neurodegenerative disease^[21].

Antibacterial Activity and anti-fungal activity

Three new prenyl flavonoids isolated from the seed of *P. corylifolia* showed antibacterial activity against *Staphylococcus aureus* and *S. epidermidis*^[22]. Another study revealed that extract of *Psoralea corylifolia* seeds were active against both Gram+ve bacteria and Gram-ve bacteria. Moreover, the present work clearly demonstrates that the presence bakuchiol has a key role for antimicrobial activity of *Psoralea corylifolia*^[23].

It is demonstrated that the *methanol seed extract* of *P. corylifolia* comprises of a promising antifungal activity against *M. furfur*, *C. albicans*, and *A. niger* as compared to seed oil^[24].

It was found that *methanol extract* of leaves of *P. corylifolia* in both concentration (2% and 4%) were showing best significant result for having antimicrobial activity^[29].

The *methanolic*, *acetone* and *hexane* extracts and isolated compound, bakuchiol (2) of *Psoralea corylifolia* were tested for antimicrobial studies against three-gram positive bacteria and showed positive results. The compound bakuchiol (2) showed an excellent antibacterial activity than its crude extract^[34].

Anti-tumour/ Anti Cancerous activity

The volatile fraction (fraction I) and three other fractions (fraction II, III, IV) from methanol extract of *P. corylifolia* L. were isolated. The Fraction IV significantly inhibits the growth of cancer cells (KB, KBv200, K562 and K562/ADM) in a dose-dependent manner^[31].

Administration of the extract of *Psoralea corylifolia* was found to inhibit EAC ascitic tumour growth and stimulate natural killer cell activity, antibody-dependent cellular cytotoxicity, antibody-forming cells and the antibody complement-mediated cytotoxicity during tumour development^[37].

Anti-AIDS activity

Psoralea corylifolia is also used for the treatment of AIDS. Psoralen and Isopsoralen, the main active compounds isolated from *Psoralea corylifolia* are being investigated against AIDS^[32].

Anti-diabetic activity

The anti-diabetic and anti-oxidant potential of *ethanolic* extract of seeds of *Psoralea corylifolia* were investigated in streptozotocin (STZ) nicotinamide induced type 2-diabetic rats. The findings indicate that *Psoralea corylifolia* has significant anti-hyperglycemic and antioxidant activity^[33].

Immunomodulatory activity

Psoralea corylifolia seed extract has been found to stimulate the immune system in mice^[37].

Conclusion

Psoralea corylifolia is an important medicinal plant with thousands of years of clinical application. The plant parts have been extensively used in vitiligo, psoriasis, asthma, ulcers and kidney disorders. Recent researches also validated the indications of Babchi (*Psoralea corylifolia*) such as in diabetes, as immunomodulator, etc. Therefore, more researches can be done to exploit the unexplored potentials of Babchi (*Psoralea corylifolia*) which have already been mentioned in Unani classical literature.

Psoralea corylifolia is an important medicinal plant with thousands of years of clinical application. The plant parts

have been used in leukoderma, psoriasis, vitiligo, asthma, ulcers, and kidney disorders. It contains various pharmacologically important compounds. The plant could be very beneficial as a daily novel food or can be promoted for its medicinal properties and more research areas could be explored based on its pharmacological properties. *Psoralea corylifolia* is an important medicinal plant with thousands of years of clinical application. The plant parts have been used in leukoderma, psoriasis, vitiligo, asthma, ulcers, and kidney disorders. It contains various pharmacologically important compounds. The plant could be very beneficial as a daily novel food or can be promoted for its medicinal properties and more research areas could be explored based on its pharmacological properties. *Psoralea corylifolia* is an important medicinal plant with thousands of years of clinical application. The plant parts have been used in leukoderma, psoriasis, vitiligo, asthma, ulcers, and kidney disorders. It contains various pharmacologically important compounds. The plant could be very beneficial as a daily novel food or can be promoted for its medicinal properties and more research areas could be explored based on its pharmacological properties.

Conflict of interest: The author has declared that no conflict of interest exists.

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