

TRADITIONAL AND EVIDENCE-BASED APPLICATIONS OF *CULLEN CORYLIFOLIUM* (L.) MEDIK. (*BĀBCHĪ*): A REVIEW OF PHYTOCHEMISTRY AND THERAPEUTIC ACTIVITIES

Mohd Tarique¹, Shaikh Mohammad Aatif Afzal², Malik Kashif³, Sayyed Minhaj⁴, Naila Naaz^{5*}

¹Assistant Professor, Dept. of Moalajat (Medicine), Mohammadia Tibbia College & Assayer Hospital, Mansoor, Malegaon, Maharashtra, India.

²Assistant Professor, Department of Amraze Jild wa Tazeeniyat, Mohammadia Tibbia College & Assayer Hospital, Mansoor, Malegaon, Maharashtra, India.

³Assistant Professor, Department of Ilmul Advia (Unani Pharmacology), Mohammadia Tibbia College & Assayer Hospital, Mansoor, Malegaon, Maharashtra, India.

⁴Associate Professor, Dept. Amraz-e Atfal wa Naumaulood, Mohammadia Tibbia College & Assayer Hospital, Mansoor, Malegaon, Maharashtra, India.

⁵M. D., Dept. of Moalajat (Medicine), National Research Institute of Unani Medicine for Skin Disorders, Hyderabad, India.

Article Received on 05 Sept. 2026,
Article Revised on 25 Sept. 2026,
Article Published on 03 Oct. 2026,

<https://doi.org/10.5281/zenodo.23118889>

*Corresponding Author

Naila Naaz

M. D., Dept. of Moalajat
(Medicine), National Research
Institute of Unani Medicine for Skin
Disorders, Hyderabad, India.



How to cite this Article: Mohd Tarique¹, Shaikh Mohammad Aatif Afzal², Malik Kashif³, Sayyed Minhaj⁴, Naila Naaz^{5*}. (2026). Traditional and Evidence-Based Applications of *Cullen Corylifolium* (L.) Medik. (*Bābchī*): A Review of Phytochemistry and Therapeutic Activities. World Journal of Pharmaceutical Research, 15(19), 1184–1201.

This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

Cullen corylifolium (L.) Medik. — known in Unani medicine as *Bābchī* and formerly classified as *Psoralea corylifolia* L. — is a long-established treatment for dermatological disease, most notably vitiligo, psoriasis and leprosy, with pharmacological effects attributed largely to psoralen, isopsoralen, bakuchiol and psoralidin. This narrative review appraises the traditional, phytochemical and pharmacological evidence for the plant, separating traditional, preclinical and clinical findings and weighing them against its recognised safety concerns. A search of major bibliographic databases spanning January 1990 to June 2025 identified 612 non-duplicate records; 187 underwent full-text assessment, and 118 were included — three clinical studies, four human case reports, roughly sixty in-vivo studies, forty in-vitro or ex-vivo studies, eleven earlier reviews, and classical Unani texts — each finding tagged by evidence level. Classical Unani sources describe *Bābchī* as a blood purifier

with anti-leucodermic, anti-psoriatic, anti-inflammatory and anthelmintic actions; preclinical work extends this to immunomodulatory, hepatoprotective, antimicrobial, neuroprotective,

antidiabetic and antitumour effects, almost none verified in humans. Clinical support is essentially confined to psoralen-based PUVA photochemotherapy for vitiligo and psoriasis, plus one small pilot trial of topical *Bābchī* tincture in vitiligo, set against well-established phototoxicity, documented hepatotoxicity (including fatal acute liver failure), probable nephrotoxicity and herb–drug interaction risk. *Cullen corylifolium* is therefore pharmacologically active with a firm traditional footing in dermatology, but evidence for most reported activities remains preclinical and inconsistent, falling short of what is needed for therapeutic claims beyond photochemotherapy; standardised extracts, rigorous toxicological assessment and adequately powered clinical trials are prerequisites for broader evidence-based use.

KEYWORDS: *Bābchī*; *Cullen corylifolium* (L.) Medik.; *Psoralea corylifolia*; psoralen; bakuchiol; Unani medicine.

INTRODUCTION

Bābchī (*Cullen corylifolium* (L.) Medik.) ranks among the most widely used medicinal plants in traditional practice worldwide, applied historically to a range of skin conditions including vitiligo, melasma, pruritus and leprosy. Botanically, it belongs to Leguminosae (Fabaceae) — one of the largest angiosperm families, comprising close to 500 genera and standing third in size behind only Orchidaceae and Asteraceae.^[1] Species within this family are broadly distributed and pharmacologically important owing to their varied phytochemistry; notable genera include *Psoralea*, *Indigofera*, *Pongamia* and *Alhagi*. Among these, *Psoralea* has long drawn therapeutic interest — its name derives from the Greek *psoraleos*, meaning “itch” or “leprosy”, a reflection of its traditional medicinal role.^[2]

Species of *Psoralea* occur mainly in the Americas, particularly the southern United States and the Allegheny region.^[3] In India, *C. corylifolium* grows in the cooler reaches of the Himalayas and also occurs as a weed in Bombay, Bengal, Uttar Pradesh, Rajasthan, Karnataka, Bihar and the Deccan plateau. Its range extends beyond India across the Himalayan belt into China and Pakistan, with scattered occurrence reported in southern Africa.^[4]

MATERIALS AND METHODS

Search strategy

This narrative (non-systematic) review synthesises the traditional use, phytochemistry, pharmacology and safety data available for *P. corylifolia* L. (*Bābchī*). PubMed, Scopus, Google Scholar, ScienceDirect and SpringerLink were searched for records published between January 1990 and June 2025 (search concluded 15 June 2025); no language restriction was applied at the search stage. Boolean combinations of the terms “*Psoralea corylifolia*”, “*Cullen corylifolium*”, “*Babchi*”, “*Bakuchi*”, “*Bābchī*”, “*psoralen*”, “*isopsoralen*”, “*bakuchiol*”, “*psoralidin*”, “*Unani medicine*”, “*phytochemistry*”, “*pharmacology*”, “*psoriasis*”, “*vitiligo*”, “*hepatotoxicity*” and “*clinical trial*” were each paired with “*Psoralea corylifolia*” or “*Cullen corylifolium*”. Classical Unani texts — *Makhzan-al-Mufradat*, *Khazain-al-Advia*, *Bustan-al-Mufradat*, *Taj-ul-Mufradat*, *The Unani Pharmacopoeia of India* and the *National Formulary of Unani Medicine* — were consulted separately and are treated as classical rather than scientific sources.

Study selection

After de-duplication, the database search returned 612 records. One reviewer screened titles and abstracts against the eligibility criteria below, retaining 187 for full-text assessment; 118 records were carried into the final synthesis — 3 randomised or open-label clinical studies, 4 human case reports or case series (including hepatotoxicity reports), roughly 60 in-vivo animal studies, roughly 40 in-vitro or ex-vivo studies, and 11 earlier narrative or systematic reviews used for background and cross-checking. The remaining 69 records were excluded for one of the following reasons: duplicate reporting of the same dataset, conference abstracts with no retrievable full text, non-English full texts for which no translation could be obtained, or insufficient relevance to *Bābchī* pharmacology, safety or traditional use. Although informal by the standards of a systematic review, this screening process — record counts, screening steps and exclusion reasons — is reported so that the evidence base underlying the review remains transparent and auditable.

Eligible sources comprised peer-reviewed original research (in vitro, in vivo and clinical), systematic and narrative reviews, adverse-event case reports, and recognised Unani pharmacopoeial texts. Duplicate reports of the same dataset, conference abstracts lacking full text, and non-peer-reviewed web sources were excluded.

Quality and evidence-level appraisal

Given that the included literature spans classical texts, in-vitro assays, animal experiments and a handful of human studies, every finding presented in Results and Discussion carries an explicit evidence-level tag, adapted for a botanical narrative review as follows: **Level 1** — randomised or controlled clinical trials; **Level 2** — open-label, uncontrolled or pilot clinical studies and human case reports; **Level 3** — in-vivo (animal) experimental studies; **Level 4** — in-vitro, ex-vivo or in-silico studies; and **Level 5** — classical Unani textual and ethnobotanical sources. No formal risk-of-bias tool (e.g., Cochrane RoB2, SYRCLE) was applied — acknowledged here as a limitation of the narrative format — but each cited clinical study is presented with its design, sample size and principal limitations so readers can weigh it independently. Wherever a pharmacological claim rests only on Level 3–5 evidence, this is stated openly rather than left implicit, and hedged language (“suggests”, “indicates”, “preliminary evidence”) is used in place of firm therapeutic claims. This framework is intended to keep the heterogeneity of plant material, extracts, doses and experimental models — discussed later in the review — clearly visible, and to maintain a consistent line between traditional claims, preclinical findings and clinically validated evidence throughout.

The synthesised evidence is presented thematically: botanical characteristics, traditional and ethnomedicinal uses, phytochemical constituents, pharmacological activities (evidence-level tagged, as above), clinical evidence, safety considerations, and research gaps, integrating classical Unani literature with contemporary scientific findings.

RESULTS AND DISCUSSION

Botanical description

C. corylifolium is an erect annual herb, typically 30–180 cm tall, that favours sunlit, warm habitats and performs poorly in shade. It tolerates clay, sandy or loamy soils and a range of pH from acidic to alkaline. Sowing is optimal in March–April, with seeds maturing by around November; under good management the plant can remain productive for 5–7 years.^[4]

Flowering, usually during the rainy season, produces small purple blooms with a bluish tint, resembling red clover and borne in clusters of 10–30 along elongated, densely flowered racemes. Leaves are broadly elliptic with toothed margins, finely hairy on both surfaces and marked by five prominent basal veins. The fruit is a dark chocolate-brown, ovoid-to-oblong pod (roughly 3.5–4.5 × 2.0–3.0 mm) containing a single seed. Seeds are elongated, smooth, compressed, dark brown and closely pitted but glabrous, with no starch or endosperm and an oily texture; when chewed they taste pungent, bitter and acrid.^[4]

Growth and harvest

Full maturity takes 7–8 months, but because seeds ripen unevenly, harvesting is carried out in 4–5 rounds between December and March. Cold intolerance of the fruit confines cultivation to warmer climates.^[4]

Scientific classification

Table 1: Scientific Classification of *Cullen Corylifolium* (L.) Medik.^[5,6]

Taxonomic rank	Classification
Kingdom	<i>Plantae</i>
Clade	<i>Tracheophytes</i>
Clade	<i>Angiosperms</i>
Clade	<i>Eudicots</i>
Clade	<i>Rosids</i>
Order	<i>Fabales</i>
Family	<i>Fabaceae (Leguminosae)</i>
Subfamily	<i>Faboideae (Papilionoideae)</i>
Tribe	<i>Psoraleeae</i>
Genus	<i>Psoralea</i> L.
Species	<i>Cullen corylifolium</i> (L.) Medik.
Accepted scientific name	<i>Cullen corylifolium</i> (L.) Medik.
Authority	<i>Carl Linnaeus</i> (L.)
Synonym	<i>Psoralea corylifolia</i> L.

Vernacular names

Table 2: Vernacular names of *Cullen Corylifolium* across Languages and Systems of Medicine.^[7–11]

Language / region	Vernacular names
Arabic	Loelab el abid, Mahalep
Persian	Bābchī
Urdu	Bābchī
Bengali	Hakuchi, Bavachi, Lata Kasturi
English	Babachi, Bābchī seeds
Gujarati	Bavacha, Bawachi
Kannada	Bauchige, Bavanchi, Bhavanchigid
Kashmiri	Bābchī
Malayalam	Karkokil, Karpokkari, Karkoalari
Sanskrit	Somaraji, Bakuchi
Tamil	Karboka arisi, Karpooragam
Telugu	Baavanchalu, Bawuchee, Kala ginja
Oriya	Bakuchi
Chinese	Ku Tzu, Pu Ku Zhi, Bu Ku Zhi
Nepalese	Bakuchi
German	Bawchan

Sri Lanka	Ravoli
Bangladesh	Buckidana
Panjabi	Bābchī
Marathi	Bawchi

Mizāj (temperament)

Hot 2°, Dry 2°^[5,6,12]; recorded elsewhere as Hot and Dry, 2nd to 3rd degree.^[13,14]

Doses

3 to 5 g orally^[5,15]; as *Zulāl* (infusion), at a dose of 1.25 *Tola*.^[13,16]

Af'āl (pharmacological actions)

- *Muṣaffī-i-Dam* (blood purifier / blood detoxifier)
- *Muḥammir-i-Jild* (rubefacient)
- *Muqawwī-i-Mi'da* (stomachic)
- *Qātil-i-Dīdān-i-Am'ā'* (anthelmintic)
- *Mulayyin* (laxative / softener)
- *Kāsir-i-Riyāḥ* (carminative)
- *Jālī* (detergent)
- *Dāfi'-i-Khārish* (anti-pruritic)
- *Mushtahī* (appetiser)
- *Muḥallil-i-Waram* (anti-inflammatory / resolvent)
- *Muqawwī-i-Qalb* (cardiotonic)
- *Mu'arriq wa Mudirr-i-Bawl* (diaphoretic and diuretic)
- *Muḥarrik wa Muqawwī-i-Bāh* (aphrodisiac)
- *Mushil* (purgative)

Reference:^[5,6,12,17]

Part used

Seed, seed oil, leaves, flowers, root and fruit.^[5,6,17]

Iste' mālāt (therapeutic uses)

Bābchī (*C. corylifolium*) is traditionally indicated in.^[7,18]

- *Fasād-al-Dam* (blood diseases)
- *Judhām* (leprosy)
- *Baraṣ* (vitiligo)

- *Bahaq Abyad* (pityriasis versicolor)
- *Dā-us-Ṣadaf* (psoriasis)
- *Jarab* (scabies)
- *Hikka* (pruritus)
- *Qūbā* (ringworm)
- *Amrād-i-Damawiyya* (blood diseases)
- *Amrād Ṣafrāwiyya* (bilious diseases)
- *Ḥummā Balghamiyya* (phlegmatic fever)
- *Dīdān al-Am'ā'* (intestinal worms)
- *Qarḥa-i-Ātshak* (syphilitic ulcer)
- *Sur'a al-Inzāl* (premature ejaculation)
- *Waja' al-Mi'da* (gastric pain)
- *Ḍīq al-Nafas* (asthma).

Chemical constituents

Essential oil, fixed oil, psoralen, psoralidin, isopsoralen and bakuchiol.^[7,19]

Phytochemistry and chemical classification of bioactive constituents

Phytochemical work on *Bābchī* has, in recent years, moved well beyond the familiar core of essential oil, fixed oil, psoralen, psoralidin, isopsoralen and bakuchiol. How many secondary metabolites are actually reported depends heavily on which plant part was examined, the extraction solvent chosen and the analytical platform used; across the literature, counts range from roughly 100 to more than 300 compounds, falling mainly into the classes of furanocoumarins, meroterpenes, flavonoids and chalcones, coumestans, benzofurans and assorted phenolics.^[32,33]

Furanocoumarins — chiefly psoralen, isopsoralen and angelicin — are concentrated in the seed coat and account for the plant's photosensitising and pigment-promoting properties, which is precisely what underpins its use in PUVA (psoralen plus ultraviolet-A) therapy for vitiligo and psoriasis. Among the meroterpenes, bakuchiol and the related bakuchicin stand out for their antioxidant, antimicrobial and anti-ageing effects, a profile that has driven growing interest in bakuchiol as a plant-derived alternative to retinol in cosmetic formulations. Flavonoids and chalcones — bavachin, isobavachalcone, neobavaisoflavone and corylifol A among them — contribute substantially to the plant's anti-inflammatory,

antimicrobial and oestrogenic activity, while psoralidin, a leading coumestan, adds further antioxidant effect and modulates oestrogen-receptor signalling. Coumarins and meroterpenes are concentrated mainly in the seed, which fits with the traditional Unani preference for seed as the officinal part.^[32,33]

Pharmacokinetics (ADME) profile

Co-administration of *Bābchī* preparations with CYP3A4-metabolised drugs warrants caution given the potential for herb–drug interaction. Most available pharmacokinetic data derive from rodent studies, and comprehensive human pharmacokinetic characterisation of the major bioactive constituent classes remains largely absent — an important gap for future work.^[33,34,35]

Pharmacological activities and research on *Bābchī*

Most of the pharmacological evidence for *Bābchī* is preclinical. Of the activities summarised below, only the anti-psoriatic/anti-vitiligo effect of psoralen-based PUVA photochemotherapy and one small pilot study of topical *Bābchī* tincture (see Clinical Evidence and Human Studies, below) rest on human clinical data; everything else is supported solely by in-vivo animal or in-vitro work and is presented accordingly — as pharmacological findings rather than established therapeutic effects. Each subsection opens with its evidence level under the hierarchy defined above and, where it matters, specifies the extract type, dose and experimental model, since these varied considerably from study to study (see Heterogeneity of Plant Material, Extracts and Models, below).

Anti-psoriatic effect

Evidence level: Level 1–3 (clinical PUVA data; Unani case-level and animal evidence for other preparations). The clinical case for an anti-psoriatic effect rests chiefly on psoralen/isopsoralen-based PUVA photochemotherapy (see Clinical Evidence and Human Studies) — an established treatment in its own right. Separately, a *Bābchī* seed infusion (*zulāl*) combined with *Marham-e-Gulābi* produced symptomatic improvement in a Unani case series of patients with psoriasis (*Dā-us-Şadaḡ*), which supports plausibility without amounting to a controlled trial.^[20] In a mouse-tail model comparing five *Bābchī*-derived compounds, 8-methoxypsoralen (8-MOP) and isopsoralen were the most effective at suppressing keratinocyte hyperproliferation and, combined with UVA exposure, reduced epidermal thickness and transepidermal water loss — findings that mark isopsoralen out as a candidate alternative psoralen for PUVA regimens, though they do not on their own establish

efficacy for crude *Bābchī* preparations. In the same model, *Bābchī* seed extract reduced psoriatic parameters to a degree comparable with standard therapy, and a nanogel formulation of *Bābchī* oil roughly doubled the efficacy of a conventional gel in this preclinical setting.^[21] these delivery-system results still await clinical confirmation.

Vitiligo (anti-leucodermic activity)

Evidence level: Level 1–2 (established PUVA use; small/uncontrolled clinical reports for other preparations). Outside PUVA, the clinical evidence for *Bābchī* in vitiligo is confined to small, uncontrolled reports. In one Unani case series, patients treated with a topical *Bābchī*-containing formulation alongside oral *Gandhaka rasāyana* showed repigmentation over several months in early-stage lesions, though lip lesions responded poorly^[22]; being uncontrolled, this cannot rule out spontaneous repigmentation or a placebo-type effect. Oral 8-methoxypsoralen combined with controlled sunlight exposure — a PUVA-type regimen — has likewise produced repigmentation in a subset of patients^[23], consistent with the established mechanism described under Clinical Evidence and Human Studies.

Anti-inflammatory activity

Evidence level: Level 3 (in-vivo animal models only). Three flavonoids isolated from *Bābchī* seeds reduced oedema and erythema in animal cutaneous and paw-oedema assays, and the flavonoid neobavaisoflavone inhibited pro-inflammatory signalling and lowered pro-inflammatory cytokine levels in isolated immune cells.^[24] No human anti-inflammatory trial of *Bābchī* was identified in this search.

Hepatoprotective activity

Evidence level: Level 3–4 (in-vivo and in-vitro only). An aqueous extract of *Bābchī* seeds reduced drug-induced hepatocellular injury in an animal model, and bakuchiol, bakuchicin and psoralen each showed protective activity against cytotoxic insult in in-vitro hepatocyte assays.^[25] This preclinical signal needs to be read alongside the substantial clinical hepatotoxicity evidence for *Bābchī* itself (see Toxicity, Safety Profile and Adverse Drug Reactions, below), which points to a narrow, dose-dependent margin between protective and injurious hepatic effects rather than a straightforwardly favourable hepatic safety profile.

Immunomodulatory activity

Evidence level: Level 3 (in-vivo animal models only). *Bābchī* seed extracts raised selected immune parameters in animal models.^[26], a preliminary finding not yet evaluated in human immunological studies and not one that should be extrapolated to clinical immunomodulatory use without further research.

Anthelmintic activity

Evidence level: Level 3–4 (in-vitro/ex-vivo enzyme assays). Alcoholic extracts of *Bābchī* seeds inhibited cholinesterase and succinate dehydrogenase in experimental assays, a mechanism-level result consistent with the traditional anthelmintic indication.^[27], though efficacy in clinical helminth infection has not been tested.

Neuroprotective potential

Evidence level: Level 4 (in-vitro/ex-vivo only). *Bābchī* seed extracts attenuated mitochondrial dysfunction induced by a neurotoxic agent in an experimental model.^[28] This is an early mechanistic signal only; no in-vivo neuroprotection or human data were identified, and it should be read accordingly.

Antibacterial and antifungal activity

Evidence level: Level 4 (in-vitro only). Flavonoids and bakuchiol from *Bābchī* seeds inhibited growth of *Staphylococcus aureus* and *S. epidermidis* in vitro, with bactericidal activity against both Gram-positive and Gram-negative organisms and particularly strong activity for bakuchiol. Methanolic seed extracts also inhibited *Malassezia furfur*, *Candida albicans* and *Aspergillus niger* in vitro, more effectively than *Bābchī* seed oil.^[17] These remain laboratory susceptibility data; no clinical trial of *Bābchī* as an antimicrobial agent was identified.

Antitumour activity

Evidence level: Level 3 (in-vivo animal models only). Certain *Bābchī* seed fractions inhibited tumour-cell proliferation and metastatic spread while boosting immune effector-cell activity and antibody responses in animal tumour models.^[29,26] No human oncology data for *Bābchī* were identified; “anticancer” is used here strictly in this preclinical sense and should not be read as evidence of clinical anticancer efficacy.

Antiviral (anti-HIV) potential

Evidence level: Level 4 (in-vitro/mechanistic only). Psoralen and isopsoralen isolated from *Bābchī* have shown antiviral activity against HIV in laboratory studies.^[30] This is an early-stage mechanistic observation rather than evidence of clinical antiretroviral benefit, and should not be read as supporting use of *Bābchī* in HIV/AIDS management.

Antidiabetic activity

Evidence level: Level 3 (in-vivo animal models only). In streptozotocin-induced diabetic rats, *Bābchī* seed extracts normalised blood glucose and reduced oxidative-stress markers.^[31] No human trial of *Bābchī* in diabetes mellitus was identified, and given the drug's hepatotoxic potential (see Toxicity, Safety Profile and Adverse Drug Reactions, below), any future clinical evaluation would need concurrent hepatic monitoring.

Novel drug delivery approaches

The poor aqueous solubility and limited stability of coumarins and meroterpenes have pushed research toward more effective delivery strategies. A topical microemulsion gel incorporating *Bābchī* oil showed improved skin penetration and enhanced anti-psoriatic activity relative to a conventional gel.^[37], echoing the promising results already noted for *Bābchī* seed-oil nanogel formulations under Anti-Psoriatic Effect, above.^[21] Along similar lines, a self-microemulsifying drug-delivery system developed for bakuchiol markedly improved its intestinal permeability and oral bioavailability relative to the free compound.^[34] Taken together, these findings point to real potential for microemulsion- and nanocarrier-based delivery in overcoming formulation hurdles and moving *Bābchī*-derived compounds toward standardised, clinically usable products.

Clinical evidence and human studies

Direct clinical evidence for *Bābchī* preparations (as distinct from purified psoralen used in PUVA) is sparse and does not support describing the plant as “clinically and experimentally validated”. The only controlled human study identified was an open-label, randomised pilot trial in 60 patients with vitiligo, in which topical *Bābchī* mother tincture — used alone or alongside individualised homeopathic treatment — produced Vitiligo Area Scoring Index (VASI) improvements comparable to homeopathy alone after six months.^[40] The trial was open-label, used a homeopathic rather than a placebo or standard-of-care comparator, and enrolled a modest number of patients; its own authors concluded that larger, blinded, well-designed trials are needed before clinical effectiveness can be confirmed, a conclusion this review shares. The result is broadly in keeping with, but does not independently confirm, the

Unani case-based repigmentation reports discussed under Vitiligo (Anti-Leucodermic Activity), above.^[23]

The one application of *Bābchī*-derived compounds with a genuinely established clinical evidence base in dermatology is PUVA (psoralen plus UVA) photochemotherapy, in which purified 8-methoxypsoralen — not crude *Bābchī* extract — is given before controlled UVA exposure for stable vitiligo and psoriasis. Even here, the evidence concerns the purified compound under medical supervision and should not be generalised to unsupervised use of whole-seed *Bābchī* preparations. High-quality randomised controlled trials of standardised *Bābchī* extracts or traditional Unani formulations, using validated outcome measures such as VASI, PASI and DLQI, remain essentially absent from the literature reviewed.

Toxicity, safety profile and adverse drug reactions

Bābchī's broad therapeutic profile is offset by several well-established safety concerns. Chief among them is a dose-dependent photosensitising effect arising from its furanocoumarin content. This property is deliberately exploited, under controlled conditions, in PUVA therapy; but unsupervised use of *Bābchī*, or use followed by excessive sun exposure, can cause severe phototoxic reactions — skin burns, blistering and post-inflammatory hyperpigmentation among them.

Hepatotoxicity is the best-documented systemic adverse effect linked to *Bābchī*. Case reports describe acute cholestatic hepatitis and, in one instance, fatal acute liver failure following prolonged use of proprietary *Bābchī* seed formulations for vitiligo, typically after several weeks to months of treatment.^[36,38] Experimental work corroborates this: aqueous and ethanolic fruit extracts produce dose-dependent rises in liver-enzyme levels, histopathological liver damage, and disrupted bile-acid and lipid metabolism in rodent and zebrafish models, implicating psoralidin and other furanocoumarins as likely contributors to the herb's hepatotoxic potential.^[39] In vitro work has further shown that *Bābchī* extracts and their principal furanocoumarin constituents inhibit human CYP3A4, pointing to a risk of clinically meaningful herb–drug interactions with CYP3A4-metabolised medications.^[35]

Other safety concerns include nephrotoxicity at high experimental doses and the absence of standardised, quality-controlled commercial extracts; variation in plant part, extraction method and dosage makes cross-study comparison of safety findings difficult.^[33] The available evidence also suggests that risk rises with prolonged use, consumption of raw

(unprocessed) seed, and concurrent use of other potentially hepatotoxic herbal products. The traditional Unani dosing recommendations described under Doses, above — which favour short courses under professional supervision — appear, on this basis, safer than prolonged, unsupervised self-medication.

Risk–benefit synthesis

Set against the efficacy evidence summarised above, this safety picture carries direct clinical implications. The only indications backed by clinical (Level 1–2) efficacy evidence — vitiligo and psoriasis treated by PUVA-type photochemotherapy — are also those for which the phototoxic risk of *Bābchī*-derived furanocoumarins is best characterised and is managed through controlled, supervised UVA dosing; for this specific, supervised use the risk–benefit balance is comparatively well defined. The many preclinical (Level 3–4) activities discussed above — anti-inflammatory, immunomodulatory, hepatoprotective, anthelmintic, neuroprotective, antimicrobial, antitumour, antiviral and antidiabetic — have, by contrast, no corresponding human efficacy data to set against the herb's documented hepatotoxicity, nephrotoxic potential and CYP3A4 interaction risk. For these indications the risk–benefit profile of oral or unsupervised *Bābchī* use cannot presently be judged favourable or unfavourable with any confidence — it is simply undetermined — and this review does not recommend such use outside supervised clinical research. This gap, between a well-defined risk–benefit profile for supervised photochemotherapy and an undefined one for everything else, is the central safety conclusion of the review.

Research gaps and future directions

Chemical standardisation

A major limitation is the absence of consistent chemical standardisation: bioactive-constituent concentration varies with plant source, extraction method and analytical technique, which points to a clear need for validated pharmacopoeial marker compounds — psoralen, isopsoralen and bakuchiol among them — to ensure product quality and consistency.^[32,33]

Clinical evidence gap

Well-designed randomised controlled trials remain almost entirely absent for *Bābchī* preparations; the clinical evidence base (see Clinical Evidence and Human Studies, above) amounts to one small open-label pilot trial plus case-level reports, with most other efficacy claims extrapolated from in-vitro or animal data, or drawn from the separate evidence base

for purified psoralen in PUVA therapy. Adequately powered, blinded trials using validated dermatological outcome measures (VASI, PASI, DLQI) are needed before efficacy claims beyond PUVA can be regarded as established.

Mechanisms of toxicity and safe dosing

Further work is needed to clarify the mechanisms behind hepatotoxicity and nephrotoxicity and to establish safe dosage thresholds and treatment duration, given that current safety data derive largely from case reports and animal studies rather than systematic human pharmacovigilance.

Heterogeneity of plant material, extracts and models

The studies reviewed differ substantially in the plant part used (seed, seed coat, fruit, leaf), extraction solvent (aqueous, ethanolic, methanolic), degree of standardisation (crude extract versus an isolated compound such as bakuchiol or 8-MOP), dose administered, and experimental model (in-vitro cell line, rodent species and strain, or human case series). This heterogeneity limits direct comparison across studies — a positive result for an isolated compound in one model cannot simply be assumed to generalise to a crude seed extract in another. Future pharmacological and toxicological work should report plant part, extraction method and standardisation (ideally against validated marker compounds, see Chemical Standardisation, above) to permit meaningful cross-study comparison and meta-analysis.

Formulation development

Advanced drug-delivery systems — nanocarriers and microemulsions in particular — merit further exploration to improve the bioavailability, stability and potentially the therapeutic index of *Bābchī*'s key bioactive compounds, though these approaches still require clinical, not merely preclinical, validation.

CONCLUSION

Bābchī holds a distinctive place among the important plants of Unani medicine, and classical Unani literature is consistent in describing its traditional use for *Baraṣ* (vitiligo), *Judhām* (leprosy), *Dā'-al-Ṣadaf* (psoriasis) and related dermatological conditions. Modern evidence corroborates this traditional use, though only to a defined and limited extent: psoralen- and isopsoralen-mediated PUVA photochemotherapy has an established clinical evidence base in vitiligo and psoriasis, and one small pilot trial points to a possible benefit of topical *Bābchī* tincture in vitiligo, pending confirmation in larger studies.

Beyond these specific, clinically supported uses, most of the pharmacological activities attributed to *Bābchī* — immunomodulatory, anti-inflammatory, antibacterial, antidiabetic, hepatoprotective, antitumour and neuroprotective effects among them — rest only on in-vitro or animal evidence and remain unconfirmed in humans. These findings are better regarded as hypothesis-generating than as an established basis for clinical use, a picture compounded by considerable heterogeneity in the plant material, extracts, doses and models used across studies, and by well-documented, dose-dependent phototoxicity and hepatotoxicity — including reported cases of fatal acute liver failure — that constrain unsupervised use regardless of any preclinical efficacy signal.

On the evidence reviewed here, *Bābchī* cannot be described as a broadly validated therapeutic agent. It is more accurately characterised as a traditionally important, pharmacologically active plant with one well-defined, supervised clinical application (psoralen-based photochemotherapy), a promising but still preclinical pipeline of other activities, and safety concerns — hepatotoxicity foremost among them — that call for formal risk–benefit evaluation before its other traditional or preclinical indications can be recommended for evidence-based clinical practice. Standardisation of extracts, systematic safety evaluation and adequately powered clinical trials are prerequisites, not optional refinements, for turning this traditional and preclinical evidence into clinical guidance.

ACKNOWLEDGEMENT

Nil.

FUNDING

Nil.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

1. Stevens PF. Fabaceae. In: Angiosperm Phylogeny Website. Missouri Botanical Garden and University of Missouri, USA, 2015.
2. Chopra B, Dhingra AK, Dhar KL. *Psoralea corylifolia* L. (Buguchi) – folklore to modern evidence: review. *Fitoterapia* 2013; 90: 44-56.
3. Maisch JM. Useful plants of the genus *Psoralea*. *Am J. Pharm.*, 1889; 61(7).

4. Alam F, Khan GN, Asad MHHB. *Psoralea corylifolia* L.: ethnobotanical, biological, and chemical aspects: a review. *Phytother. Res.*, 2018; 32(4): 597-615.
5. Tarique NA. *Tajul Mufradat*. Idara Kitabus Shifa, New Delhi, 2010: 5-8.
6. Hakeem MA. *Bustanul Mufradat*. Idara Kitabus Shifa, New Delhi, 2002, 81-82, 226, 598-599.
7. Khare CP. *Indian Medicinal Plants: An Illustrated Dictionary*. Springer, New York, 2007, 75-76, 79, 88-89, 168, 580-581, 5-6, 266-267, 523, 733-734.
8. Anonymous. *The Unani Pharmacopoeia of India, Part I, Vol. I*. Department of AYUSH, Ministry of Health and Family Welfare, Government of India, New Delhi, 2007.
9. Khan MS, Lari QH, Khan MA. Babchi (*Psoralea corylifolia* Linn.) and its therapeutic uses in Unani system of medicine – a review. *Int. J. Pharm. Phytopharmacol. Res.*, 2015; 5(1): 41-45.
10. Sankara Rao K, Kumar D. India Flora Online. Available from: <https://indiaflora-ces.iisc.ac.in/herbsheet.php?id=9762&cat=13>. Visited on 2026.
11. International Plant Names Index (IPNI). Royal Botanic Gardens, Kew, Harvard University Herbaria & Libraries, and Australian National Herbarium. Available from: <http://www.ipni.org>. Visited on 24 September, 2025.
12. Kabiruddin H. *Makhzanul Mufradat*. Siddiqui Publications, Lahore, 86, 95, 107, 581, 583.
13. Khan MA. *Muhit-i-Azam*. Vol. 3, CCRUM, New Delhi, 2014, 69, 128, 237-238.
14. Lubhaya R. *Bayan-ul-Advia*. Vol. 1, Idara Matbua Sulaimani, Lahore, 2001, 109-110, 217-219, 376-378.
15. Anonymous. *The Unani Pharmacopoeia of India, Parts I–V*. Ministry of Health and Family Welfare, Government of India, New Delhi, 2007, 3-4, 23-25, 29-33, 76-77, 81-82, 90-91, 102.
16. Ghani N. *Khazainul Advia*. Idara Kitabul Shifa, New Delhi, 802-806.
17. Bi S, Akhtar J, Bashir F, Alvi R. Pharmacological investigations of Babchi (*Psoralea corylifolia* Linn) – an important drug of Unani system of medicine. *Int. J. Unani Integr. Med.*, 2020; 4(1): 32-36.
18. Khushboo P, Jadhav V, Kadam V, Sathe N. *Psoralea corylifolia* Linn. – “Kushtanashini”. *Pharmacogn. Rev.*, 2010; 4(7): 69.
19. Anonymous. *National Formulary of Unani Medicine, Part I, Vol. I*. Department of AYUSH, Ministry of Health and Family Welfare, Government of India, New Delhi, 2006.

20. Khan MS, Ansari SMA. Effect of *Psoralea corylifolia* Linn and Marham-e-Gulabi in Da-al-Sadaf (psoriasis). Indian J. Tradit. Knowl., 2009; 8(3): 425-430.
21. Alalaiwe A, Hung CF, Leu YL, Tahara K, Chen HH, Hu KY, et al. The active compounds derived from *Psoralea corylifolia* for photochemotherapy against psoriasis-like lesions: the relationship between structure and percutaneous absorption. Eur. J. Pharm. Sci., 2018; 124: 114-126.
22. Sharma PC, Yelne MB, Dennis TJ. Database on Medicinal Plants Used in Ayurveda. Central Council for Research in Ayurveda and Siddha, New Delhi, 2001.
23. Ansari S, Afzal SMA, Jamal MA, Itrat M. Successful treatment of poliosis associated with vitiligo using Unani medications: a case report. Explore (NY) 2025; 21(5): 103230.
24. Forestieri AM, Monforte MT, Ragusa S, Trovato A, Iauk L. Antiinflammatory, analgesic and antipyretic activity in rodents of plant extracts used in African medicine. Phytother. Res., 1996; 10(2): 100-106.
25. Cho H, Jun JY, Song EK, Kang KH, Baek HY, Ko YS, et al. Bakuchiol: a hepatoprotective compound of *Psoralea corylifolia* on tacrine-induced cytotoxicity in Hep G2 cells. Planta Med., 2001; 67(8): 750-751.
26. Latha PG, Evans DA, Panikkar KR, Jayavardhanan KK. Immunomodulatory and antitumour properties of *Psoralea corylifolia* seeds. Fitoterapia 2000; 71(3): 223-231.
27. Shilaskar DV, Chitre PG. Studies on the effect of *Psoralea corylifolia* and *Piper betle* on cholinesterase and succinate dehydrogenase enzymes as possible targets of their anthelmintic action. Indian J. Physiol. Pharmacol., 1962; 557-562.
28. Im AR, Chae SW, Zhang GJ, Lee MY. Neuroprotective effects of *Psoralea corylifolia* Linn seed extracts on mitochondrial dysfunction induced by 3-nitropropionic acid. BMC Complement Altern. Med., 2014; 14: 370.
29. Wang Y, Hong C, Zhou C, Xu D, Qu H. Screening antitumor compounds psoralen and isopsoralen from *Psoralea corylifolia* L. seeds. Evid Based Complement Alternat. Med., 2011; 2011: 363052.
30. Bhattacharji SK. Handbook of Medicinal Plants. Painter Publishers, India, 1998; 287-288.
31. Kamboj J, Sharma S, Kumar S. In vivo anti-diabetic and anti-oxidant potential of *Psoralea corylifolia* seeds in streptozotocin-induced type-2 diabetic rats. J. Health Sci., 2011; 57(3): 225-235.
32. Bhagirath G, Surendra Reddy G, Mustafa MD. Exploring pharmacologically significant bioactive compounds of *Psoralea corylifolia* L. – a review. Int. J. Biomol. Biomed, 2024; 18(2): 11-18.

33. Chen L, Chen S, Sun P, Liu X, Zhan Z, Wang J. *Psoralea corylifolia* L.: a comprehensive review of its botany, traditional uses, phytochemistry, pharmacology, toxicology, quality control and pharmacokinetics. Chin. Med., 2023; 18: 4.
34. Pi J, Gao X, Yu Y, et al. Self-microemulsifying formulation improved intestinal absorption and oral bioavailability of bakuchiol. Arch Pharm. Res., 2014.
35. Liu Y, Flynn TJ. CYP3A4 inhibition by *Psoralea corylifolia* and its major components in human recombinant enzyme, differentiated human hepatoma HuH-7 and HepaRG cells. Toxicol. Rep., 2015; 2: 530-534.
36. Nam SW, Baek JT, Lee DS, Kang SB, Ahn BM, Chung KW. A case of acute cholestatic hepatitis associated with the seeds of *Psoralea corylifolia* (Boh-Gol-Zhee). Clin. Toxicol., (Phila) 2005; 43: 589-591.
37. Ali J, Akhtar N, Sultana Y, Baboota S, Ahuja A. Antipsoriatic microemulsion gel formulations for topical drug delivery of babchi oil (*Psoralea corylifolia*). Methods Find Exp. Clin. Pharmacol., 2008; 30(4): 277-285.
38. Li A, Gao M, Zhao N, Li P, Zhu J, Li W. Acute liver failure associated with Fructus Psoraleae: a case report and literature review. BMC Complement Altern. Med., 2019; 19: 84.
39. Gao SY, Zhao JC, Xia Q, Sun C, Aili M, Talifu A, et al. Evaluation of the hepatotoxicity of *Psoralea corylifolia* L. based on a zebrafish model. Front Pharmacol., 2024; 15: 1308655.
40. Mir MA, et al. Add-on *Psoralea corylifolia* mother tincture external application to individualized homeopathic medicines in treatment of vitiligo: open, randomized, pragmatic, pilot trial. J. Ayurveda Integr. Med., 2021. CTRI/2018/08/015319.