PSORALEA CORYLIFOLIA - A **COSMETIC BOON**

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ABSTRACT

Babchi (*Psoralea corylifolia*) is a herbal plant that grows in tropical and subtropical regions of Asia, including India, China and Japan It has been well known for its use in traditional medicine and also massive cosmetic uses. The plant grows in arid to semi-arid climates and is cultivated by agriculture at a controlled planation method where the supply of material quality can be established. The *Psoralea corylifolia* plant is enriched with bioactive compounds such as psoralen and bakuchiol together with flavonoids and phenolic compounds that are useful in pharmaceuticals, medicinal preparations, nutraceuticals, and everyday human cosmetic formulations. These compounds are used for skin-whitening, anti-aging and moisture preservation in cosmetics. Yet it is not without possible adverse effects, including photo toxicity and allergic reactions as well as respiratory irritation skin burns. A major point of focus is bakuchiol, a principal ingredient in *Psoralea corylifolia*, and how it compares to retinol for anti-aging skincare. Clinical trials suggest that bakuchiol can give similar results to retinol, including improvement in skin texture and collagen production but with fewer side effects. This points to bakuchiol as a practical alternative for individuals with sensitive skin. Further understanding of the *Psoralea corylifolia* properties and potential clinical applications, as well its practical use noninvasively could help to consider it in contemporary dermatological care treatment which would be partially focused on avoiding adverse irritant for treating skin diseases.

Keywords **:** *Psoralea corylifolia ,* Bakuchiol, Skin Care

INTRODUCTION

Babchi (*Psoralea corylifolia*) is one of the herbs in Ayurveda traditional medicine system. The plant has been treasured for its healing powers since the ancient times. This is because of the many health benefits offered by *Psoralea corylifolia*, which makes this herb a very useful potent plant in Ayurveda that can help to improve pigmentation and skin conditions like vitiligo or psoriasis. Traditional Chinese Medicine attributes treatment with the plant to kidneys and spleen meridians rather than using it just topically for skin issues. The utilization of Babchi in these traditional medical systems provide a basis for the widely extended role as natural curing agent, informing exploration into its medicinal or cosmetic applications in modern times [1].

The seed plant originates from the leguminous plants of Asia's tropical and subtropical regions, such as India, China and Japan. The plant is common in India and the folks belong to states like Gujarat, Rajasthan, Bihar, Maharashtra, and also southern and north eastern states. This plant grows well in hardy soils which are well drained including sandy and loamy while in environmental factor, these plants can be planted in wide range of condition but will show best growth in warm areas with temperature ranging from 20-35°C. *P. corylifolia* is easily available at traditional medicine markets. From scrublands to managed environments alone, it can grow in a wide array of habitats and with wild populations that are easily harvested from both the field as well as cultivated sources ensures an abundant quantity needed for traditional medicines or cosmetics [2].

EVALUATING THE COSMETIC VALUES OF PSORALEA CORYLIFOLIA

Sometimes the minute anatomy of plants, and in particular that of *Psoralea corylifolia* has been discussed by previous workers for its identification especially for quality control purpose. This species has distinctive seed surface characteristics with a shiny and smooth testa together with elevated ridges. Anatomically, the transverse section of a seed shows various layers of parenchyma cells and epidermis with palisade layer/ cells around its seed coat while spongy paranenchma deal; which acts as storage area and contains elongated oil glands and spherical starch granules. These traits are useful in identification of plant and also can be utilized for its purity assessment in herbal formulations.

Psoralea corylifolia is known to contain several bioactive compounds such as psoralen, bakuchiol, flavonoids and phenolic acids within its phytoconstituent skeleton. These components are responsible for the medicinal and cosmetic properties of the plant, which include skin pigmentation improvement, antimicrobial activity, anti-inflammatory effects. The broad range of compounds that the plant has, is what makes it so adaptable, and good for traditional medicinal use as well as skincare products today [2,3].

Different parts of *Psoralea corylifolia* besides seeds; such as leaves, fruits and roots also contain bioactive compounds used for the formulation both in medicinal purposes and cosmetic industries. The seeds have one of the highest concentrations of bakuchiol and psoralen, both well-studied compounds for their sun-protective power and anti-ageing agents. Psoralen is one kind of photosensitizing agent that can be used for skin diseases, such as vitiligo, to recover the pigmentation with phototherapy. Bakuchiol is a natural alternative to retinol and has long been hailed for its skin texture improving, wrinkle reducing and collagen boosting effects. They also have significant flavonoids and phenolic contents in their leaves and roots, which are responsible for important antioxidant, antimicrobial and anti

inflammatory effects. Since then, *Psoralea corylifolia* is used in numerous cosmetic products for the treatment of acne and signs of skin-ageing as well as to improve cutaneous hydration and repair [3].

Due to the high demand of *Psoralea corylifolia* in both traditional medicine and modern cosmetic formulations, concern has been raised on substitutions or adulteration that would occur within herbal market. The less scrupulous way is that they adulterate the *Psoralea corylifolia* with other plant species (which are cheaper, and or toxic too), by mixing it in parts to lower their production costs. This can lead to safety and efficacy concerns in the final product, with risks for consumers. For example, several species from the same botanical family like *Psoralea esculenta* and Psoralea *glandulosa* possess similar morphological resemblance but differ significantly in their phytochemical constitution and pharmacological activity. For products containing *Psoralea corylifolia*, it is important to identify the plant botanically and imply more quality control measures. *Psoralea corylifolia* allied species like *Cullen corylifolium*, is also reported from few regions. Though the bioactive compounds in these species are likely similar to *Psoralea corylifolia*, their effectiveness and potential safety profile have not been established. Therefore, an analysis of the phytochemical diversity between other allied species and their therapeutic potentials is necessary to prepare a safe herbal formulation. Detailed research on taxonomy, genetic diversity and chemical composition of *P. corylifolia* species may facilitate precise utilization these plants in traditional and contemporary medicines along with the conservation aspects as well [4].

GEOGRAPHICAL DISTRIBUTION, COLLECTION AND CULTIVATION

Native Range and Spread: *Psoralea corylifolia* originates from tropical and subtropical areas of Asia and is notably found in countries like India, China, and Japan. In India, it is prevalent in states such as Gujarat, Rajasthan, and Maharashtra, as well as in the southern and northeastern regions of the country. The plant has been introduced to other parts of Asia and even to some regions of Africa due to its medicinal value. In China, it is widely cultivated and used in traditional Chinese medicine (TCM) [4,5].

Wild and Controlled Collection: *Psoralea corylifolia* is frequently gathered from natural habitats within its native regions. It usually thrives in arid and semi-arid conditions, commonly found in scrublands, open forests, and disturbed areas. Given its importance in traditional medicine, the plant is also cultivated in managed environments to maintain a consistent supply of high-quality material [4].

Cultivation:

1. Environmental Conditions

Psoralea corylifolia thrives in well-drained, sandy, or loamy soils and is adaptable to various soil types, though it performs best in neutral to slightly alkaline conditions. It prefers a warm climate with temperatures between 20°C and 35°C and is sensitive to frost, making it unsuitable for cooler environments. Additionally, the plant is drought-resistant and requires minimal watering, which suits it well for arid regions [6].

2. Agricultural Practices

Psoralea corylifolia is propagated from seeds, which are generally sown in early spring. Once the seedlings are sufficiently developed, they are transplanted. To promote healthy growth, regular weeding and pest management are essential. Occasionally, the plant is cultivated alongside other crops to enhance soil fertility and reduce pest issues [6].

3. Harvesting:

The plant is harvested when the seeds are fully matured. While both the seeds and leaves are traditionally used, the seeds are particularly valued for their medicinal properties. Harvesting is typically done by hand, and post-harvest processing includes drying and, if needed, grinding the seeds for use in various preparations [6].

PHYTOCONSTITUENTS

Psoralea corylifolia (Babchi) is known for its rich array of phytoconstituents, which contribute to its medicinal properties. Table 1.1 gives details of the same.

Table 1.1: Different types of Phytoconstituents found in *Psoralea corylifolia*

Phytoconstituents	Type	Properties	Reference
Psoralidin	Flavonoid	Anti-oxidant, anti-inflammatory	[5]

Bavachin	Flavonoid	Anti-inflammatory, antimicrobial	[5]
Psoralen	Coumarin	Phototoxic, used in vitiligo and psoriasis	[5]
Isopsoralen	Coumarin	Therapeutic effects in skin diseases	[5]
Corylin	Terpenoid	Anti-inflammatory, anti-cancer	[7]
Bavachinone	Phenolic compound	Anti-inflammatory, anti-oxidant	[7]
Oleanolic acid	Triterpenoid	Anti-inflammatory, hepatoprotective	[5]
Volatile Oil Constituents	Essential Oils	Antimicrobial, therapeutic	[8]
Bacoside A	----	Cognitive, neuroprotective	[7]

COSMETIC USES

Skin Whitening and Treatment of Hyperpigmentation: Psoralen, a primary component of *Psoralea corylifolia*, has long been utilized for treating skin issues like vitiligo and hyperpigmentation. Its phototoxic effects can aid in diminishing pigmentation when combined with UV light therapy [10].

Anti-ageing: *Psoralea corylifolia* is rich in antioxidants that combat free radicals, thereby alleviating oxidative stress and minimizing signs of aging such as wrinkles and fine lines. The plant's flavonoids and phenolic compounds play a key role in its anti-aging effects [3].

Acne Treatment: *Psoralea corylifolia* is beneficial for treating acne and other inflammatory skin conditions due to its antimicrobial and anti-inflammatory properties. Extracts from the plant can alleviate acne lesions and calm irritated skin [11].

Skin Hydration and Repair: *Psoralea corylifolia* is included in cosmetic products to boost skin hydration and aid in skin repair. Its extracts are added to creams and lotions to enhance skin moisture levels and texture [12].

Treatment of Dark Circles: The plant's extracts are sometimes used in eye creams due to their potential to lighten dark circles and reduce puffiness around the eyes [13].

ADVERSE EFFECTS

Long-term use of products made from *Psoralea corylifolia* can potentially lead to several adverse effects, primarily due to its active compounds such as psoralen and other phytoconstituents. Listed below are some potential adverse effects:

Phototoxicity: Psoralen can increase skin sensitivity to sunlight, leading to a higher risk of sunburn, pigmentation alterations, or skin damage when exposed to UV light [14].

Allergic Reactions: Certain individuals might experience allergic reactions to *Psoralea corylifolia* extracts, which could manifest as rashes, itching, or swelling. Instances of hypersensitivity or allergic dermatitis have been documented in some cases [15].

Skin Irritation: Extended use of products containing *Psoralea corylifolia* might lead to skin irritation, dryness, or redness, particularly in those with sensitive skin [16].

Hormonal Effects: Certain studies indicate that prolonged use may impact hormonal balance, possibly affecting estrogenic activity [17].

Drug Interactions: Products containing *Psoralea corylifolia* could interact with specific medications, potentially affecting their efficacy or heightening the risk of side effects [18].

MARKETED FORMULATIONS

In India, *Psoralea corylifolia* is incorporated into various skincare and cosmetic products. Table 1.2 gives a list of some marketed formulations available in the Indian market, including their types, brand names, company names, doses, and approximate prices.

Table 1.2: Various products found in the Indian market that are incorporated with *Psoralea corylifolia*

Type	Brand name	Company	Dose	Price (In Rs.)
Sunscreen	Sunscreen with Psoralea	Ayush Herbs	50 g	Rs. 350 – 500
Anti-aging cream	Baiyuhan anti-aging cream	Baiyuhan Pharmaceuticals	50 g	Rs. 450 – 600

Skin whitening cream	Pso – Rite whitening cream	Pso- Rite	40 g	Rs. 400 – 500
Acne treatment gel	Pso – Glow gel	Herbal Glow	15 g	Rs. 250 – 350
Moisturizing lotion	Moisture Plus Psoralea Lotion	Dermacare	100 ml	Rs. 300 – 400

Herbal Soap	Herbal Care Psoralea Soap	Herbal Essentials	100 g	Rs. 100 – 150
Under – Eye cream	Bright Eyes Psoralea Cream	Radiant Skincare	15 ml	Rs. 350 – 500

COMPARATIVE ANALYSIS OF BAKUCHIOL AND RETINOL

UVA radiation causes oxidative stress, leading to skin damage and photoaging. This occurs when unstable oxygen molecules, known as reactive oxygen species (ROS), overwhelm the skin's natural antioxidant defenses. ROS damage collagen, leading to wrinkles and skin sagging. UVA also upregulates collagen-degrading enzymes, causing long-term collagen loss. Additionally, UVB impairs the skin's mechanical barrier function, leading to water loss and dryness. Bakuchiol, a natural compound found in the plant *Psoralea corylifolia*, has been shown to have anti-aging and antioxidant properties. It has been studied as a potential alternative to retinol, a common anti-aging treatment, but with less irritation and a more favorable safety profile. This review aims to examine the current literature on the effects of topical bakuchiol on photoaging and determine if it is a comparable alternative to retinol [10].

The traditional Ayurvedic practice of pretreating Bakuchi (*Psoralea corylifolia*) fruits involves methods like Niranjana (immersion), Bharjana (roasting), and Prakshalana (washing) to enhance bioavailability and efficacy. These methods alter the chemical composition of Bakuchi, forming new pharmacologically active molecules. Specific media like cow's urine, ginger juice, and ghee are used, contributing to immunomodulatory and antioxidant activities. Pretreated Bakuchi may

effectively treat skin disorders like vitiligo by reducing oxidative stress and inflammation. This traditional practice has a scientific basis, potentially enhancing therapeutic efficacy and safety [26,27].

A comparative study was conducted to evaluate the effects of Retinol and Bakuchiol on skin. The study used a combination of in vitro experiments, including cell culture and DNA microarray analysis, as well as an in vivo clinical study with 17 healthy subjects over 12 weeks. The results showed that Bakuchiol had similar anti-aging effects to Retinol, with improved collagen production and skin hydration, but was gentler and less irritating. The clinical study also showed significant improvements in fine lines, wrinkles, skin tone, and radiance with Bakuchiol. Overall, the study suggests that Bakuchiol is a natural, effective alternative to Retinol for anti-aging and skin improvement, and further research is needed to confirm and expand on these findings [2].

Another study compared the effects of Bakuchiol and Retinol on skin, using a combination of in vitro and in vivo experiments. Bakuchiol was obtained from Sytheon Ltd, while Retinol was purchased from Sigma-Aldrich. In vitro studies were conducted using human dermal fibroblasts (HDFs) to determine the antioxidative capacity and power of both substances, as well as their effects on various protein levels. The results of these experiments were then compared to those of in vivo studies, which included an ex vivo determination of FN protein levels in suction blister fluid samples and a split-face comparison study to assess skin condition improvement. Statistical analysis was performed using various software packages, including Microsoft Excel, SAS Software Package, and GraphPad Prism. The study aimed

to evaluate the efficacy and potential benefits of Bakuchiol as a natural alternative to Retinol for anti-aging and skin improvement [28,29].

One study conducted a 12-week, randomized, double-blinded, and rater-blinded clinical trial from March to November 2017. It aimed to compare the effects of bakuchiol and retinol on facial wrinkles and pigmentation. 50 healthy participants (age 47 ± 7.2 years) were recruited, exclusion criteria included pregnancy, breastfeeding, known sensitivity to retinol or bakuchiol, cutaneous disease, recent use of certain skincare products, smoking, and recent facial surgical or cosmetic procedures. Participants were randomly assigned to receive either 0.5% retinol cream or 0.5% bakuchiol cream. Bakuchiol was isolated from *Psoralea corylifolia* seeds with a purity of over 99%. Participants applied the creams as directed (retinol at night while bakuchiol twice daily). The study aimed to detect a 20% difference in wrinkle severity between the bakuchiol and retinol

treatments at week 12, with a power analysis showing >90% power to detect this difference [29,30].

A similar experiment was conducted to evaluate the efficacy and safety of a 3-in-1 Night Facial Serum (NFS) containing melatonin, bakuchiol, and ascorbyl tetraisopalmitate. The study involved 24 participants aged 40-75 years with moderate skin aging, who applied the serum nightly for 12-24 weeks. The primary objectives were to assess the serum's efficacy in modifying signs of skin aging, both clinically and histologically. Secondary objectives included evaluating skin tolerability, safety, and participants' opinions on the serum's efficacy. Clinical assessments were performed at 12 and 24 weeks, including skin quality assessments, investigator global assessments, and standardized photography. Skin biopsies were also taken from five participants to analyze dermal and epidermal thickness, as well as various dermal markers. Statistical analysis was performed using descriptive statistics, Student t-tests, and Wilcoxon tests to determine significant changes from baseline. The noticeable enhancement in fine lines and wrinkles, along with increased elasticity, firmness, and overall reduction in photo damage signs, including more even skin tone after 12 weeks of treatment, confirmed the in vitro findings and supported the retinoid-like effects of bakuchiol [31,32].

CONCLUSION

Psoralea corylifolia is a plant with diverse bioactive compounds, including bakuchiol, psoralen, and isoflavones, found in its seeds, fruits, and roots. These compounds exhibit a range of biological activities, such as antimicrobial, anti-inflammatory, and anti-cancer properties, making the plant a valuable resource for drug development. Traditionally used for various ailments, including skin conditions, tumors, and reproductive issues, *Psoralea corylifolia* also shows potential for therapeutic applications, including anti-feedant, anti-AIDS, anti-diabetic, and anti psoriatic activities. Additionally, the plant can be micropropagated using different explants and growth regulators, further highlighting its significance.

Bakuchiol is a natural compound derived from the seeds and leaves of the *Psoralea corylifolia* plant, commonly known as Babchi. Bakuchiol presents a compelling alternative to retinol for anti-aging skincare, offering several notable advantages while providing comparable benefits. Bakuchiol effectively mimics the anti-aging effects of retinol, such as improving skin texture, reducing fine lines, and stimulating collagen production. One of Bakuchiol's most significant advantages is its gentler profile, unlike retinol, which is known for causing irritation, dryness, and increased sun sensitivity, Bakuchiol is better tolerated by sensitive skin and does not exacerbate sun sensitivity. This makes it a suitable option for individuals who experience discomfort with retinol or those who seek a gentle approach to anti-aging. Additionally, Bakuchiol's ability to be

used both during the day and night without the need for strict sun protection offers added convenience. While retinol remains a well-established gold standard in anti-aging, Bakuchiol's effectiveness combined with its gentler, less irritating nature positions it as a valuable alternative.

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