



Beneficial Herbal Drug of *Psoralea corylifolia* for Leucoderma

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Received: 10-02-2021; **Revised:** 23-03-2021; **Accepted:** 30-03-2021; **Published on:** 20-04-2021.

ABSTRACT

The present review article introduces about leucoderma disease history, prevalence, epidemiology, pigment biochemistry, treatment and herbal drug of *Psoralea corylifolia*. Leucoderma also known as vitiligo. It is a pigmentation disorder. The most common treatment in leucoderma is the use of topical or oral psoralens followed by exposure to UVA radiation. Psoralen stimulates the skin and its produce melanin pigment when exposed to sunlight. Psoralens followed by exposure to UVA radiation in the region of 280-315 nm wavelengths.

Keywords: Leucoderma, *Psoralea corylifolia*, Psoralen, Exposure to UVA radiation.

QUICK RESPONSE CODE →

DOI:
10.47583/ijpsrr.2021.v67i02.011



DOI link: <http://dx.doi.org/10.47583/ijpsrr.2021.v67i02.011>

INTRODUCTION

Leucoderma is also known as vitiligo. It is a pigmentation disorder.¹ Leucoderma is a skin disease and the word leucoderma means. "to have white skin". There would be a gradual loss of pigment called melanin from the dermal layers that results into the white patches.² It includes the loss of functioning melanocytes which causes the appearance of white patches on the skin.³

The most common treatment in leucoderma is the use of topical (cream, ointment, oil etc.) or oral (medicine) psoralens followed by exposure to UVA radiation in the region of 280-315 nm wavelengths.⁴ A thin coat of 0.01% to 0.1% methoxsalen ointment is applied on leucoderma skin. After 30 min, the skin is exposed to 0.12J/cm² to 0.25J/cm² UVA with increments of 0.12J/cm² weekly.⁵

Psoralen is an isomer of furanocoumarin obtained from the fruits of *Psoralea corylifolia* Linn. and it is a photosensitizing agent. *Psoralea corylifolia* or Bakuchi contains furanocoumarins like psoralen.⁶ Psoralen stimulates skin to produce melanin pigment when exposed to sunlight. The *Psoralea corylifolia* seeds are believed to facilitate amino acid transport across the intestinal mucosa by acting as a photo-sensitizer for the initiation of erythema on the spots of leucoderma. Furanocoumarins initiated the transformation of DOPA (Dihydroxy

phenylalanine) to melanin under the influence of UV light or sunlight. The epidermal tissues contain free sulphhydryl groups.⁷ These sulphhydryl groups bind to the free copper ions which are required for the function of tyrosinase.⁸ *Psoralea corylifolia* helps in the release of sulphhydryl group (SH-group) bound copper as free copper, which activates the tyrosinase activity for melanin synthesis.

Aim

Aim of present investigation is beneficial herbal drug of *Psoralea corylifolia* for leucoderma.

History

The term vitiligo has been derived from the Latin word "vitilus" meaning calf and this term was first coined by Celsus, Roman physician in the 1st Century A.D.¹

According to him white patches of the disease look like the white patches of a spotted calf. Vitiligo is an antiquated disease mentioned in religious texts such as holy, quran, veda, and bible. The disease is even documented as "Bai Dian Feng" in traditional Chinese medicine, "Shewetakusta" in Indian classic Atharva Veda, "Kilas" in Vinay Pitah and "Bars" and "Phulbehri" in the Arabic and Punjabi languages.⁹

Prevalence

Leucoderma or vitiligo affects approximately 1–2% of world's population, but the prevalence has been reported as high as 4% among few of South Asian, Mexican, and American populations. In hospitals Kuala Lumpur, Malaysia during the period of 2003–2007, approximately 2.2% new cases have been reported for this disease within the same period.¹⁰



Epidemiology

Vitiligo is a common depigmenting skin disorder, with an estimated prevalence of 0.5–2% of the population in both adults and children worldwide. One of the earliest and largest epidemiological surveys to have been reported was performed on the Isle of Bornholm, Denmark, in 1977, where vitiligo was reported to affect 0.38% of the population. Vitiligo affects ethnic groups and people of all skin types with no predilection. However, there seem to be large geographic differences.¹¹

Pigment biochemistry

Melanin is the major skin pigment. It is synthesized by specialized cells called melanocytes. Melanin is formed through the series of oxidative reactions involving amino acid tyrosine in the presence of tyrosinase (enzyme). Melanocytes synthesize the melanin within the membrane controlled organelles called melanosomes and later melanosomes are transferred through dendrites to surrounding keratinocytes. Each epidermal melanocyte secretes melanosomes to approximately 40 keratinocytes (1:40) in the neighborhood, and this entire unit is called "epidermal melanin unit". Consequently, the type (eumelanin/pheomelanin) and amount of melanin synthesized by the melanocyte and its distribution in the surrounding keratinocytes determine the actual color of the healthy skin.

There are four major steps involved in melanogenesis process:

- I. The development of melanocyte precursor cells (melanoblasts) and their migration from the neural crest to peripheral sites.
- II. Differentiation of melanoblasts into melanocytes.
- III. Survival and proliferation of melanocytes.
- IV. Formation of melanosomes and production of melanin.

All the four steps are important for normal melanin biosynthesis and any disturbance in the melanin pathway results in either hypopigmentation or hyperpigmentation of skin.¹

Treatment

In the present review we highlight the combination therapy of herbal drug *Psoralea corylifolia* containing psoralen and exposure of UV radiation.

Patients with vitiligo or leucoderma have areas of completely white skin. PUVA or phototherapy is combination treatment of psoralen and exposing skin to UV radiation. PUVA (UVA is long wave radiation and UVB is short wave radiation) can bring about some repigmentation, particularly for vitiligo of the face and dark skinned patients. Results for other body sites and white skinned patients are less encouraging. Treatment is usually twice a week for two years. Even then complete

repigmentation cannot be guaranteed and relapse is possible.¹²

Many different modalities have been used and continue to be used for the treatment is given below¹:

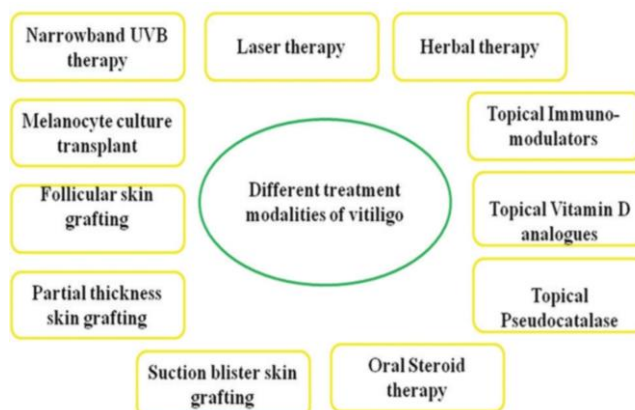


Figure 1: Represents different treatment modalities of leucoderma

PSORALEA CORYLIFOLIA

Vernacular name:

- English: Babchi seeds, Psoralea seeds
- Gujrati: Bavachi
- Hindi: Babchi, Bavachi, Bakuchi¹³

Family:

- Leguminosae

Chemical constituents:

Psoralea corylifolia extract contains several phytochemicals are :

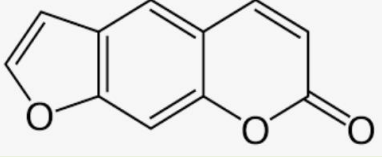
- Flavonoids (neobavaisoflavone, isobavachalcone, bavachalcone, bavachinin, bavachin, corylin, corylifol, corylifolin and 6-prenylnaringenin),
- Meroterpenes (bakuchiol and 3-hydroxybakuchiol)
- Furanocoumarins (psoralidin, psoralen, isopsoralen and angelicin).¹⁴

The furanocoumarins, which contain psoralen it is promote pigmentation on the skin. The table given below the information about psoralen.^{15,16}

Table 1: Drug profile of psoralen

Name	Psoralen
Molecular formula	C ₁₁ H ₆ O ₃
Molecular weight	186.16 g/mol
IUPAC name	7H-furo[3,2-g]chromen-7-one



Structure	
State	Solid
Melting point	163.00 to 164.00 °C
Boiling point	362.00 to 363.00 °C
Extract	From the seed of <i>Psoralea corylifolia</i> L.
Solubility	Psoralen is soluble in organic solvents such as ethanol, Dimethyl sulfoxide (DMSO), and dimethyl formamide (DMF), which should be purged with an inert gas. The solubility of psoralen in ethanol is approximately 1 mg/ml and approximately 30 mg/ml in DMSO and DMF. Psoralen is sparingly soluble in aqueous buffers.
Storage conditions	Keep container tightly closed in a dry and well-ventilated place. <ul style="list-style-type: none"> – Recommended storage temperature: 2-8 °C. – Light sensitive. – Store in the dark. – Store under inert gas. <p>Keep in a dry place.</p>
Mechanism of Action	Melanocytes are activated and pigmentation occurs over the following week. This action is used to repigment areas of disfiguring depigmentation, e.g. vitiligo in black-skinned persons. In the presence of UVA the psoralen interacts with DNA, forms thymine dimers and inhibits DNA synthesis.
Uses	Skin diseases like Psoriasis, Vitiligo
Adverse effects	Itching, Redness, Burns, Blisters, Freckles or aged skin.

Parts used:

- Seeds
- Seed oil
- Roots
- Leaves^{17,18}



Figure 2: *Psoralea corylifolia* seed



Figure 3: *Psoralea corylifolia* seed oil



Figure 4: *Psoralea corylifolia* leaves

Mechanism of action for leucoderma:

The drug seem to have a purely local action with a specific effect on the arterioles of the sub capillary plexuses, which are dilated so, that the plasma is increased in this area.

The skin becomes red and the melanoblasts (pigment for mingcells) are stimulated. In leukoderma, melanoblasts do not function correctly and their stimulation by the drug leads them to for mandexudate pigments, which gradually

diffuse into the white leukodermic patches.^{19,20} Also, the phytochemically induced covalent binding of the drug to pyrimidine bases is responsible for its therapeutic effect.

The photo co-occurrence involves thymine dimer adducts on the opposite strands of DNA. Psoralen has been found to intercalate into DNA, where they form mono- and di-adducts in the presence of long wavelength UV light and thus, are used for the treatment of hypopigmented disease of the skin like leukoderma.²¹

Other activities:

Psoralea corylifolia or Bakuchi has strong antioxidant properties and increases the blood circulation locally, thus provides nutrition to the cells present in the skin.²² *Psoralea corylifolia* extracts have been reported to possess.

- Antibacterial activity²³
- Antifungal activity²⁴
- Antioxidant²⁵
- Anti-inflammatory activity²⁶
- Antifilarial activity²⁷
- Estrogenic activity²⁸
- Antitumor activity²⁹
- Immune-modulatory activity³⁰

Psoralea corylifolia proved to be safe and non-irritant and can be used for longer periods of the day because it showed no irritation and is non-sensitizer. One of the bioactive isolated compound “psoralen” found to have the ability to stimulate the development of melanin and therefore it is employed for leucoderma treatment.³¹

Most of the external applications were advised to be applied in sunlight. The use of sunlight in early morning on affected area of skin helps because it has content of ultraviolet rays and with leads to favourable milieu for promoting the growth of melanocyte migration and stimulates proliferation³². It is not only enough in proliferation of melanocyte but also prevents the auto immune activity disease³³.

Acknowledgments: I am thankful to my guide **Ms. Payal N Vaja**, the person who makes me to follow the right step during the review project. A part from that her valuable and expertise, suggestion during documentation of my report indeed help me a lot. I would heartily thankful to head of department **Dr. C. J. Tank** to give me an opportunity to work over this project and for their endless great support.

CONCLUSION

Psoralea corylifolia is a very often found as a herb on the way side and at waste place throughout India. The plant of *Psoralea corylifolia* has been used since centuries in leukoderma or vitiligo disorder. It is reported essential oil.

The furanocoumarins, which contain psoralens it stimulates the skin to produce melanin pigment when exposed to sunlight. *Psoralea corylifolia* also used as antifungal, antitumor, antioxidant, antibacterial agents etc.

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Source of Support: None declared.

Conflict of Interest: None declared.

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