



# Avalgubeejadi Churna: A Comprehensive Review Integrating Ayurvedic Fundamental with Modern Scientific Evidence

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## KEYWORDS

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## ABSTRACT:

Avalgubeejadi Churna is an important herbal-mineral formulation mentioned in *Aṣṭāṅghṛdayam* for the treatment of vitiligo and skin disorders.

This review integrates Ayurvedic references, modern pharmacognosy, phytochemical studies, and clinical evidence. The formulation comprises powdered seeds of *Psoralea corylifolia* (Bakuchi) and purified *Haratala* (arsenic trisulfide), levigated with cow's urine.

The combination of furanocoumarins from Bakuchi and processed *Haratala* demonstrates melanogenic, antimicrobial, antioxidant, and immunomodulatory properties. Bakuchi promotes melanogenesis and repigmentation through photochemotherapy mechanisms, while properly processed *Haratala* provides *Rasayana* (rejuvenating), anti-inflammatory, and antimicrobial activities. Recent clinical studies have verified the therapeutic potential of the formulation.

Avalgubeejadi Churna represents a promising herbo-mineral approach to vitiligo treatment, though standardization protocols and long-term safety data for the arsenical component remain necessary for wider clinical adoption.

## 1. Introduction

Ayurveda employs a unique class of medicines called *Rasa-aushadhi* (herbo-mineral formulations) that undergo extensive processing (*Śodhana* and *Marana*) of metals and minerals. The purpose of this processing is to eliminate inherent toxicity while enhancing therapeutic efficacy [1-3]. Avalgubeejadi Churna represents an eminent example, described in the *Aṣṭāṅghṛdayam* (*Uttarasthana* 13/76-77) [4]. This paste or topical application is indicated for *Śvitra* (hypopigmentation) [4], a condition with complex etiology involving autoimmune and multifactorial causes [44].

The effectiveness of this formulation relies on the synergistic combination of plant and mineral-based materials. Bakuchi (*Psoralea corylifolia*) is recognized in Ayurvedic classical texts for its pigment-restoring effects [5]. It is classified as *Kusthaghna* (treating skin diseases)

and *Śvitrahara* (removing white patches) [5, 8]. The seeds require preliminary treatment for detoxification and therapeutic enhancement to maximize skin compatibility [9].

*Haratala*, classified as an *Uparasa* (secondary mineral) in *Rasa Shastra* texts [2, 3], is orpiment or arsenic trisulfide ( $As_2S_3$ ). The purification process (*Śodhana*) is essential to transform toxic raw mineral into a therapeutically active agent [12, 24].

Cow urine acts as a *Yogavahi* (bio-enhancer), increasing transdermal delivery and potency of the active ingredients [25, 27].

This review aims to scientifically validate the principles of Avalgubeejadi Churna by linking its traditional usage to contemporary pharmacology and phytochemistry.



## 2. Classical Sources and Literary Review

The formulation and its individual components are deeply rooted in established Ayurvedic literature.

### 2.1. Primary Reference: The Aṣṭāṅghṛdayam

The specific directions for preparing *Avalgujabeejadi Churna* derive from the Aṣṭāṅghṛdayam [4]. According to this text, *Bakuchi* seeds should be finely powdered and mixed with one-quarter portion of *Haratala*. This mixture is then levigated with cow urine (*Gomutra*) to form a smooth paste. This Lepa is applied topically for Śvitra, aiming to restore natural skin color (*savarna-karaṇa*) [4].

### 2.2. Corroborating Classical Texts

Individual components are extensively documented in authoritative classical references:

*Charaka Samhita* and *Sushruta Samhita*: Both texts classify *Bakuchi* in groups treating skin diseases (*Kushtaghna*) and microbes (*Krimighna*), demonstrating its utility in various dermatological conditions [1, 5, 11]. *Charaka* additionally notes its internal benefits for constitutional imbalances associated with these conditions [1].

*Rasa Shastra* Classics: *Rasaratna Samuccaya* [2] and *Rasatarangini* [3] meticulously detail mandatory *Śodhana* (purification) processes for *Haratala*. These texts classify it as an *Uparasa* [12] and specifically recommend its use in skin and inflammatory conditions due to its potent anti-inflammatory and tissue-cleansing (*Vranashodhaka*) effects after proper processing [36].

*Nighantus*: Works such as *Bhāvaprakāśa* [13] and *Kaiyadeva Nighantu* [14] list *Bakuchi* under *Haritakyādi Varga* with synonyms including *Somaraji* and *Suparnika*, indicating its rejuvenating (*Rasayana*) and dermatological benefits [13, 14]. They describe its primary tastes (*Rasa*) as *Tikta* (bitter) and *Katu* (pungent), both essential for clearing metabolic toxins (*Ama-pachana*) [13, 14].

## 3. Phytochemistry and Pharmacognosy

### 3.1. Botanical Profile of *Psoralea corylifolia*

*Bakuchi* is an erect annual herb reaching heights of approximately 120 cm [5]. Its characteristic feature

comprises small, dark seeds with a distinctive aroma that constitute the medicinal component.

### 3.2. Key Phytochemical Constituents

Analytical techniques including GC-MS reveal that *Psoralea corylifolia* contains multiple bioactive compounds responsible for its therapeutic effects [17, 18, 22].

**Furanocoumarins:** These compounds are critical for melanogenesis and include psoralen and isopsoralen [17, 19]. These phytochemicals enhance photosensitivity, forming the basis of modern PUVA (Psoralen plus UVA) therapy [28, 29]. Angelicin is also present in the seeds [17].

**Bakuchiol:** This major meroterpene is abundant in the essential oil [17, 20]. Despite structural differences from psoralens, it exhibits significant antimicrobial and antioxidant activities that help prevent secondary skin complications [20, 31].

**Flavonoids and Coumarins:** Seeds contain compounds such as corylin and corylifolin [21], which demonstrate anti-inflammatory and immunomodulatory properties [5]. The coumarin psoralidin exhibits cytotoxic effects with potential anticancer properties [33].

**Additional Components:** Essential oils (e.g., caryophyllene) and fatty acids (palmitic and oleic acid) contribute to restoring the skin barrier and reducing localized inflammation [22].

### 3.3. Physicochemical Transformation of *Haratala*

Crude *Haratala* containing arsenic trisulfide is highly toxic. In Ayurveda, it undergoes *Śodhana* procedures like *Swedana* of *Ashuddha Patra Haratala* by *Kushmanda Swarasa*, *Tila Kshara Jala*, *Nimbu swaras*, *Gruhadhum Jala* and *Churnodaka* [2, 3]. Research demonstrates that this process significantly alters its physicochemical properties. Analytical techniques including XRF and toxicological studies support these findings [23, 24, 37].

The purification process:

- Substantially reduces bioavailability of toxic arsenic species [23, 37]
- Converts the material into less harmful, possibly nano-sized particles [37]



- Forms stable organo-metallic complexes that reduce adverse effects while maintaining therapeutic efficacy [24]

XRF analysis of treated *Haratala* reveals significant structural modifications compared to crude ore [24].

#### 4. Ayurvedic Pharmacodynamics and Therapeutic Rationale

The therapeutic action of Avalgubeejadi Churna can be understood through the Rasa-Guna-Virya-Vipaka framework that describes drug action in the body.

**Rasa (Taste) and Guna (Quality):** Both Bakuchi and *Haratala* possess Tikta (bitter) and Katu (pungent) tastes [13, 14], with *Ruksha* (dry) and *Laghu* (light) qualities. These properties facilitate breakdown of *Ama* (metabolic toxins), considered key in the pathogenesis of *Kushta* and *Śvitra* [1]. The *Tikta* taste specifically promotes cleansing of bodily channels (Srotoshodhana) [13].

**Virya (Potency):** Both components exhibit *Ushna* (hot) potency [3, 13]. This heating property enhances local blood circulation in depigmented patches, stimulating Bhrajaka Pitta, which governs skin color and complexion [5].

**Karma (Action):** The collective actions include Kushtaghna (anti-dermatosis), *Śvitrahara* (re-pigmenting), and *Rasayana* (rejuvenating). *Haratala* specifically enhances Vranashodhaka (wound cleansing) properties, vital for non-healing skin lesions [2, 3].

**Gomutra as Bio-enhancer:** Cow urine functions as a *Yogavahi* (carrier) [25], enhancing skin permeability of phytoconstituents and the purified mineral [27]. Research confirms its role as a bio-enhancer that increases therapeutic efficacy, ensuring higher concentrations reach deeper epidermal layers [25, 26].

### 5. Contemporary Pharmacological Mechanisms

#### 5.1. Melanogenesis and Photochemotherapy

The primary mechanism parallels modern PUVA (Psoralen + UVA) therapy [28, 29]. Furanocoumarins (psoralen, isopsoralen) in Bakuchi penetrate melanocytes. Upon controlled exposure to ultraviolet A (UVA) light, they undergo photochemical reactions, forming photo-adducts and interstrand DNA cross-links [28]. This process increases melanocyte proliferation and

subsequent synthesis and transfer of melanin pigment, achieving re-pigmentation [29, 42].

#### 5.2. Immunomodulation and Antioxidant Protection

Vitiligo is an autoimmune disorder characterized by elevated oxidative stress and melanocyte destruction by cytotoxic T-cells [32, 44, 45].

**Antioxidant Effects:** Bakuchiol and flavonoids such as corylin are potent antioxidants that scavenge reactive oxygen species (ROS) and mitigate oxidative stress at vitiligo lesion margins [20, 32].

**Immunomodulation:** Bakuchi extracts demonstrate properties that may inhibit tumor development and stimulate natural killer (NK) cell activity [35]. Purified *Haratala* exhibits immunomodulatory activity by modulating local cytokine profiles, suppressing autoimmune attacks on melanocytes [36, 37].

#### 5.3. Antimicrobial and Anti-inflammatory Effects

**Antimicrobial Properties:** Bakuchi extracts, particularly the meroterpene bakuchiol, demonstrate broad-spectrum antimicrobial activity against organisms including *Staphylococcus aureus* and *Candida* species [20, 30, 31]. This prevents secondary infections commonly associated with dermatological conditions.

**Anti-inflammatory Effects:** Compounds such as bavachinin possess anti-inflammatory and antipyretic properties [5]. The *Ushna Virya* and *Katu Vipaka* of the preparation reduce local inflammation [13].

### 6. Clinical and Toxicological Evidence

#### 6.1. Clinical Efficacy

Clinical trials on Avalgubeejadi Lepa and related Bakuchi-based formulations demonstrate promising results:

A recent trial on Avalgubeejadi Lepa showed significant improvement in VASI (Vitiligo Area Scoring Index) scores after eight weeks of topical application, particularly when combined with controlled sun exposure [38].

Studies on similar Bakuchi formulations (Bakuchi Yoga) demonstrated promising outcomes for repigmentation [39].

Bakuchi oil combined with phototherapy showed enhanced pigment restoration [40].



Research on *Rasamanikya*, a *Haratala*-based formulation, demonstrated benefits in *Śvitra* and psoriasis when properly purified [41].

## 6.2. Safety and Toxicological Considerations

The presence of arsenic necessitates careful toxicological evaluation, highlighting the importance of the *Śodhana* process.

**Toxicity of Raw *Haratala*:** Crude *Haratala* exhibits significant toxicity, causing organ accumulation, systemic damage, and elevated oxidative stress in laboratory studies [23, 46].

**Safety of Purified Forms:** Conversely, purified (*Śodhita*) *Haratala* exhibits significantly reduced bioavailability of toxic arsenic species [36, 37]. Toxicity studies in rats indicate that the purified form causes minimal or no hepatic or renal damage at prescribed therapeutic doses [23, 47]. The reduction in particle size to the nano-range also contributes to decreased toxicity while maintaining therapeutic efficacy [37].

**Long-term Monitoring:** Despite the topical safety profile of Avalgubeejadi Churna, long-term monitoring remains essential. Standardization using techniques such as ICP-MS is recommended to ensure batch-to-batch consistency and detect potential accumulation of mineral components [22, 47].

## 7. Discussion and Future Directions

Avalgubeejadi Churna exemplifies how traditional formulations can meet modern scientific standards through "reverse pharmacology" approaches [3]. However, several gaps in research require attention for broader acceptance and regulatory compliance.

**Standardization Challenges:** Without standardized protocols, preparation of this formulation varies considerably, particularly regarding *Haratala Śodhana* [22, 47]. Standardization protocols should quantify active psoralen and isopsoralen content and establish maximum safe limits for arsenic [24, 47].

**Clinical Evidence:** Despite positive preliminary results, the formulation lacks large-scale, methodologically rigorous randomized controlled trials (RCTs) comparing its effectiveness with current standard treatments such as topical corticosteroids or tacrolimus [43, 45].

**Long-term Safety:** While *Śodhana* reduces acute toxicity, limited data exists regarding long-term effects of processed arsenic in topical applications. Comprehensive longitudinal studies with systematic monitoring are needed [23, 36, 47].

## 8. Conclusion

Avalgubeejadi Churna represents a promising herbo-mineral therapeutic option for *Śvitra* (vitiligo). The formulation leverages *Psoralea corylifolia* to enhance photosensitivity and provide antioxidant protection, while purified *Haratala* contributes immunomodulatory and tissue-repair properties. Cow urine functions as a bio-enhancer, facilitating delivery of active ingredients. Classical evidence supports the safety of properly processed (*Śodhita*) arsenic when handled correctly. For wider global adoption, establishment of standardization protocols and extended clinical trials monitoring long-term safety outcomes are essential.

### Conflicts of Interest:

The authors declare no conflicts of interest

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## Abbreviations:

- PUVA : Psoralen plus Ultraviolet A  
ROS : Reactive Oxygen Species  
NK : Natural Killer  
VASI : Vitiligo Area Scoring Index  
RCT : Randomized Controlled Trial  
XRF : X-ray Fluorescence  
GC-MS : Gas Chromatography-Mass Spectrometry  
ICP-MS : Inductively Coupled Plasma Mass Spectrometry- UVA: Ultraviolet A