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Review Article

Therapeutic Potential of *Inderjo Talkh* (*Holarrhena antidysenterica*) in Unani Medicine: An In-Depth Study

[a]Razia Sultana, [a]*Md Najibur Rahman, [a]Mohd. Saad Yusuf, [b]Md. Shafat Karim

[a] Department of Medicine (Moalajat), Government Tibbi College and Hospital, Patna, Bihar, India.

[b] Department of TST, Government Tibbi College and Hospital, Patna, Bihar, India.

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*Address for Correspondence:

Md Najibur Rahman, Department of Medicine (Moalajat), Government Tibbi College and Hospital, Patna, Bihar, India.

Abstract

Background: *Holarrhena antidysenterica*, commonly known as *Inderjo Talkh* in Unani medicine, has been traditionally used for treating gastrointestinal disorders, fever, skin diseases, and various infections. Despite its extensive historical usage, a detailed scientific evaluation of its therapeutic efficacy remains essential.

Objective: This study aims to explore the medicinal potential of *Holarrhena antidysenterica* in the Unani system of medicine, emphasizing its pharmacological properties, traditional applications, and modern scientific validation.

Methods: A comprehensive literature review was conducted using classical Unani texts, pharmacopoeias, and different research studies. The analysis focused on the plant's phytochemical constituents, pharmacodynamics, and therapeutic indications. Recent preclinical and clinical studies were also reviewed to assess its efficacy and safety.

Results: *Holarrhena antidysenterica* contains alkaloids, flavonoids, tannins, and glycosides, which contribute to its anti-diarrheal, anti-inflammatory, anti-microbial, and anti-oxidant properties. Unani medicine describes it as a *Mufatteh* (deobstruent), *Musaffi-e-Dam* (blood purifier), and *Muhallil-e-Waram* (anti-inflammatory) agent. Scientific studies confirm its role in treating amoebic dysentery, diarrhea, skin ailments, diabetes, and inflammatory conditions. Furthermore, the plant exhibits immunomodulatory and hepatoprotective effects, supporting its therapeutic applications.

Conclusion: *Holarrhena antidysenterica* holds significant therapeutic potential in Unani medicine, aligning with modern pharmacological findings. However, further clinical studies are necessary to validate its efficacy, optimize dosages, and ensure safety. Integrating traditional knowledge with contemporary research can enhance its application in evidence-based medicine.

Keywords: *Holarrhena antidysenterica, Inderjo Talkh*, Unani medicine, gastrointestinal disorders, anti-inflammatory, phytochemicals, traditional medicine.

Introduction

Traditional medicine has played a significant role in healthcare systems across the world, offering natural remedies for a variety of ailments [1]. Among these traditional healing systems, Unani medicine stands out as one of the most ancient and well-documented forms of medicinal science [2]. Rooted in Greek (Unani) philosophy and further enriched by Persian and Arab scholars, Unani medicine focuses on maintaining the balance of humors (*Akhlat*) in the body-blood (Dam), phlegm (*Balgham*), yellow bile (*Safra*), and black bile (Sauda) [3]. This holistic system employs a variety of herbs, minerals, and animal-derived substances to restore health [4]. One such notable herb used in Unani medicine is Inderjo Talkh (*Holarrhena antidysenterica*), a plant widely recognized for its medicinal benefits [5].

Inderjo Talkh, commonly known as Kurchi or Kutaj, belongs to the family Apocynaceae and has been extensively used in Unani and Ayurvedic medicine for centuries [6]. It is indigenous to India, Sri Lanka, and other parts of South Asia and is often found in tropical and subtropical forests [7]. The plant is primarily valued for its seeds and bark, which contains potent bioactive compounds responsible for its therapeutic properties [8]. Unani practitioners have traditionally prescribed Inderjo Talkh for its effectiveness in treating gastrointestinal disorders, chronic diarrhea, dysentery, and helminthic infections [9].

Inderjo Talkh is Mufatteh (laxative), Daf-e-Humma (antipyretic), Musaffi-e-Dam (blood purifier), and Muqawwi-e-Meda (stomach tonic) properties [10]. It is commonly used in formulations to treat intestinal disorders, particularly chronic and amoebic dysentery, which aligns with modern pharmacological findings [11].

Scientific studies have confirmed that *Holarrhena antidysenterica* contains active alkaloids such as conessine, holarrhenine, and kurchicine, which exhibit antibacterial, antifungal, anti-inflammatory, and antidiarrheal properties [7, 12]. These compounds reinforce the traditional Unani claims regarding the efficacy of Inderjo Talkh in treating digestive and infectious ailments [13].

Furthermore, contemporary research has explored the broader therapeutic potential of *Holarrhena antidysenterica* in diabetes management, liver disorders, and immune modulation [14]. Unani scholars have long emphasized its ability to strengthen the stomach, detoxify the blood, and improve digestion, making it an invaluable herb in the treatment of gastrointestinal and metabolic disorders [10]. With the increasing global interest in natural and plant-based medicines, the relevance of Inderjo Talkh in evidence-based Unani medicine is more pronounced than ever [10,1].

Despite its well-established medicinal uses, further pharmacological and clinical studies are required to validate its effectiveness and standardize its formulations [14]. The integration of Unani wisdom with modern scientific advancements could pave the way for developing novel therapeutic interventions using *Holarrhena antidysenterica* [13]. This study aims to provide an in-depth analysis of the pharmacological and clinical significance of Inderjo Talkh in Unani medicine. By bridging traditional knowledge with modern science, it hopes to highlight its potential as a natural, safe, and effective alternative for managing various diseases.

Material and methods

This study employs a comprehensive approach to explore the therapeutic potential of Inderjo Talkh (*Holarrhena antidysenterica*) in Unani medicine. A detailed literature review was conducted using classical Unani texts, pharmacopoeias, and modern scientific research databases such as PubMed, Scopus, and Google Scholar. The phytochemical composition of *Holarrhena antidysenterica* was analyzed based on existing research, and its pharmacological properties were evaluated through experimental and clinical studies reported in previous publications. Additionally, Unani formulations containing Inderjo Talkh were reviewed for their efficacy in gastrointestinal disorders, infections, and metabolic diseases to establish its relevance in traditional and modern medicine.

Botanical description

Holarrhena antidysenterica, commonly known as Inderjo Talkh, Kurchi, or Kutaj, is a significant medicinal plant belonging to the family Apocynaceae [7, 16]. It is widely distributed across India, Sri Lanka, Nepal, Myanmar, and other tropical and subtropical regions of Asia and Africa [7,17]. The plant has been extensively used in traditional Unani, Ayurvedic, and Siddha medicine for treating gastrointestinal disorders, fever, and skin diseases. Its bark, seeds, and leaves are rich in bioactive compounds, making it an essential herb in herbal pharmacology. [10,14]

Taxonomical classification [7, 17]

Rank	Classification
Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Gentianales
Family	Apocynaceae
Genus	*Holarrhena*
Species	*Holarrhena antidysenterica*

Morphological features

Habit and habitat- *Holarrhena antidysenterica* is a small to medium-sized deciduous tree or large shrub that thrives in dry deciduous forests, tropical hillsides, and open grasslands. It is often found at altitudes ranging from 300 to 1200 meters above sea level. The plant is drought-resistant and grows well in sandy and loamy soils with good drainage [7,17].

Bark-The bark of *Holarrhena antidysenterica* is one of its most medicinally valuable parts. It is thin, rough, and greyish-brown with longitudinal cracks and fissures. The inner bark is pale, bitter, and highly fibrous. It contains several alkaloids, including conessine, responsible for its antidiarrheal and anti-inflammatory properties [18].

Leaves-The leaves of *Holarrhena antidysenterica* are simple, opposite, and ovate-lanceolate with a smooth texture. They measure 8-15 cm in length and 3-6 cm in width. The upper surface is dark green and glabrous, while the lower surface is pale green with a fine layer of pubescence (hairs), which gives the species its name "pubescens." The leaves have prominent venation, and the petiole is short, measuring 0.5-1 cm [18].

Flowers-*Holarrhena antidysenterica* produces small, fragrant, white flowers that are tubular and arranged in terminal corymbose panicles. The calyx consists of five small, green sepals, while the corolla is white, five-lobed, and slightly twisted. The flowers bloom in spring and early summer and attract various pollinators like bees and butterflies [16,17].

Fruits-The plant produces characteristic long, slender, cylindrical follicles (fruits) that appear in pairs. They measure 15-30 cm in length and 0.5-1 cm in diameter. When immature, the fruits are green, turning yellowish-brown upon maturity. The follicles contain numerous flat, brownish seeds with silky hairs (coma) at one end, aiding in wind dispersal [16,17].

Seeds-The seeds are thin, flat, and oblong, measuring 5-10 mm in length. They contain a high concentration of alkaloids such as conessine, holarrhenine, and kurchine, which contribute to their antimicrobial, antidiarrheal, and anthelmintic properties. The seeds are widely used in Unani and Ayurvedic formulations to treat dysentery, chronic diarrhea, and intestinal infections [18].

Phytochemical constituents of *Holarrhena antidysenterica*

These bioactive compounds contribute to the wide range of pharmacological effects exhibited by *Holarrhena antidysenterica*, making it an important plant in Unani and Ayurvedic medicine [7, 13, 14, 19]. Table summarizing the major phytochemical constituents of *Holarrhena antidysenterica* along with their therapeutic properties.

Phytochemical Class	Major Compounds	Therapeutic Properties
Alkaloids	Conessine, *Holarrhenine, Holarrhimine*, Kurchicine	Antidiarrheal, Antimicrobial, Anti-inflammatory, Anthelmintic
Flavonoids	Quercetin, Kaempferol	Antioxidant, Anti-inflammatory, Hepatoprotective
Steroids	β-Sitosterol, Stigmasterol	Immunomodulatory, Anti-inflammatory, Antidiabetic
Tannins	Ellagic acid, Gallic acid	Astringent, Antidiarrheal, Antimicrobial
Saponins	Holarrhenoside A & B	Antimicrobial, Hemostatic, Adaptogenic
Glycosides	Kurchioside A & B	Cardioprotective, Anti-inflammatory
Essential Oils	Terpenoids, Phenolic compounds	Antiseptic, Antioxidant
Carbohydrates	Polysaccharides, Starch	Energy source, Prebiotic effects
Proteins & Amino Acids	Essential Amino Acids	Tissue repair, Growth promotion

Pharmacological properties of *Holarrhena antidysenterica*

Holarrhena antidysenterica, commonly known as Inderjo Talkh, Kurchi, or Kutaj, has been an integral part of traditional medicine, particularly in Unani and Ayurvedic systems [7]. This medicinal plant, belonging to the Apocynaceae family, is highly regarded for its gastrointestinal, anti-inflammatory, antimicrobial, and antidiabetic properties [10,12]. The pharmacological effects of *Holarrhena antidysenterica* are primarily attributed to its rich content of bioactive compounds, including alkaloids, flavonoids, tannins, and glycosides, which have been extensively studied for their therapeutic benefits. This section provides an in-depth analysis of the pharmacological properties of *Holarrhena antidysenterica*, supported by scientific studies and traditional medicinal practices.

Antidiarrheal and gastrointestinal benefits:

It is used in the treatment of diarrhea and dysentery**.** Its bark and seeds is Muqawwi-e-Meda (stomach-strengthening) and Daf-e-Is'hal (antidiarrheal) agents [7,10,20, 21].

Mechanism of action:

- The plant contains alkaloids like conessine, holarrhenine, and kurchicine, which have been shown to possess potent antimicrobial activity against diarrheal pathogens such as *Escherichia coli*, *Shigella spp.*, and *Vibrio cholerae*.
- Studies suggest that these alkaloids work by inhibiting bacterial colonization in the intestines and reducing excessive fluid loss, making it effective against infectious and chronic diarrhea**.**
- Additionally, tannins and flavonoids present in the plant exert an astringent effect, reducing intestinal motility and stabilizing bowel function.
- A clinical study demonstrated that *Holarrhena antidysenterica* bark extract significantly reduced symptoms of amoebic dysentery when compared to conventional antibiotics, highlighting its potential as a natural alternative for treating gastrointestinal infections [22,23,24]**.**

Antimicrobial and antifungal activity:

Holarrhena antidysenterica has shown broad-spectrum antimicrobial effects, making it useful in treating bacterial, fungal, and parasitic infections [25]**.**

Mechanism of action:

- The alkaloids (conessine and holarrhenine) exhibit strong bactericidal activity against gram-positive and gram-negative bacteria, including Staphylococcus aureus, Salmonella typhi, and Pseudomonas aeruginosa.
- The ethanolic extracts of the bark and seeds have demonstrated potent antifungal activity against Candida albicans and Aspergillus niger, suggesting its potential in treating skin infections and oral thrush.
- Anthelmintic effects: Research indicates that *Holarrhena antidysenterica* extracts are highly effective against intestinal worms and helminths, supporting its traditional use in treating parasitic infections.
- These findings validate the use of Inderjo Talkh in Unani medicine for combating microbial infections, particularly in gastrointestinal and dermatological disorders [26,27,28].

Anti-inflammatory and analgesic properties:

Inflammation is a key factor in many chronic diseases, and *Holarrhena antidysenterica* has been recognized for its anti-inflammatory and pain-relieving properties [29].

Mechanism of action:

- Studies have shown that methanolic extracts of *Holarrhena antidysenterica* inhibit the production of pro-inflammatory cytokines, such as TNF-α, IL-6, and prostaglandins, which are responsible for inflammation and pain.
- The plant's flavonoids and phenolic compounds contribute to reducing swelling and pain in conditions like arthritis and muscle injuries.
- A comparative study found that Holarrhena extracts had similar efficacy to NSAIDs (non-steroidal anti-inflammatory drugs) in reducing inflammation without causing gastric irritation, making it a promising natural alternative.
- This anti-inflammatory property supports its use in treating conditions such as rheumatoid arthritis, colitis, and inflammatory bowel diseases (IBD) [30,31].

Antidiabetic and hypoglycemic effects

With the growing prevalence of diabetes mellitus, medicinal plants with blood sugar-regulating properties are receiving significant attention. *Holarrhena antidysenterica* has been studied for its hypoglycemic potential [32].

Mechanism of action:

- Alkaloids and flavonoids in the plant help enhance insulin sensitivity and improve glucose metabolism.
- Studies have demonstrated that aqueous extracts of Holarrhena bark significantly lower fasting blood glucose levels in diabetic patients.
- The plant also shows potential in reducing oxidative stress in pancreatic β-cells, which are responsible for insulin production.
- Its traditional use in Unani medicine for controlling excessive thirst and frequent urination (common diabetic symptoms) further supports its effectiveness as an antidiabetic agent [33,34].

Hepatoprotective (Liver-protecting) effects:

Liver diseases, including hepatitis and cirrhosis, are often treated with herbal medicines in traditional systems. *Holarrhena antidysenterica* has shown promising hepatoprotective activity [35].

Mechanism of action:

- The plant's antioxidant compounds help neutralize free radicals, preventing liver damage.
- In studies, rats treated with *Holarrhena antidysenterica* extract showed significant improvement in liver enzyme levels (ALT, AST, ALP), indicating liver function restoration.
- It has been traditionally used in Unani formulations for treating jaundice, liver congestion, and bile disorders.
- This suggests that *Holarrhena antidysenterica* could be useful as a natural supplement for liver detoxification and support [36,37].

Immunomodulatory and antioxidant properties:

Holarrhena antidysenterica has been found to enhance immune function and protect cells from oxidative stress, both of which are crucial in preventing chronic diseases [38].

Mechanism of action:

- The plant's alkaloids and flavonoids help in regulating immune responses, making it beneficial for autoimmune conditions and infections.
- It has been studied for its role in reducing oxidative stress, which contributes to aging and chronic diseases like cancer and neurodegenerative disorders.
- The antioxidant activity of Holarrhena extracts helps in neutralizing harmful free radicals, protecting the heart, brain, and skin [39,40].

Preclinical and clinical studies

Recent preclinical studies have explored its therapeutic potential, focusing on its anthelmintic, hypolipidemic, and safety profiles.

Preclinical studies:

Anthelmintic Activity: An in vitro study investigated the anthelmintic efficacy of ethanolic extracts and ethyl acetate fractions of H. pubescens stem bark against the cestode parasite *Raillietina* species. The study found that a 10 mg/ml concentration of the crude extract was effective, with the ethyl acetate fraction showing the highest anthelmintic activity. Ultrastructural analyses revealed significant damage to the parasite's tegument and internal structures, suggesting the plant's potential as a source of anthelmintic agents [7,41].

Hypolipidemic and antihyperlipidemic effects: Research on the methanolic seed extract of H. pubescens demonstrated significant hypolipidemic and antihyperlipidemic effects in animal models. The extract reduced serum cholesterol and triglyceride levels in both normal and high-fat diet-induced hyperlipidemic rats. The proposed mechanism involves the inhibition of lipase enzyme activity, which plays a crucial role in lipid metabolism [7,42].

Toxicity and safety evaluation: A sub-acute toxicity study assessed the safety profile of H. pubescens bark ethanol extract in mice. The findings indicated that lower doses were relatively safe. However, higher doses were associated with oxidative stress, lipid peroxidation, and potential neuronal damage, emphasizing the need for cautious use and further toxicity [7,43,44].

Clinical studies:

As of now, there is a scarcity of clinical trials evaluating the therapeutic effects of H. pubescens in humans. A search of clinical trial registries did not yield results specific to this plant. The majority of available data are derived from preclinical studies, underscoring the necessity for well-designed clinical trials to validate the efficacy and safety of H. pubescens in human populations [7].

Therapeutic applications of *Holarrhena antidysenterica* [7,10,20,21]:

Therapeutic Application	Description
Gastrointestinal Disorders	Used in the treatment of diarrhea, dysentery, and colitis due to its antimicrobial and antidiarrheal properties.
Skin Diseases	Applied topically for eczema, wounds, and skin infections, owing to its antibacterial and wound-healing effects.
Diabetes Management	Helps regulate blood sugar levels, making it beneficial for diabetes control.
Liver Health	Supports liver detoxification and function, aiding in the treatment of liver disorders.
Fever and Infections	Exhibits antipyretic and antimicrobial properties, making it effective against fever and various infections.

Toxicity and safety profile of *Holarrhena antidysenterica*

Inderjo Talkh has been widely used in traditional Unani and Ayurvedic medicine for treating gastrointestinal disorders, infections, and metabolic diseases [7,10]. Despite its therapeutic benefits, it is essential to assess its toxicity and safety profile to ensure its safe medicinal use [45]. Pharmacological studies indicate that *Holarrhena antidysenterica* is generally safe at therapeutic doses, with minimal side effects. However, high doses or prolonged use may lead to gastrointestinal disturbances, nausea, vomiting, and mild hepatotoxicity. Alkaloids such as conessine, holarrhenine, and kurchicine, while beneficial, can exhibit cytotoxic effects at excessive concentrations [7,46]. Animal studies suggest that acute toxicity manifests at significantly high doses, but no severe organ damage or mortality has been reported in controlled doses [47]. Traditional Unani practitioners emphasize the importance of dosage regulation and often combine Inderjo Talkh with other herbal formulations to minimize side effects [48]. Clinical data on its long-term toxicity remain limited, necessitating further research to establish its safety for pregnant women, lactating mothers, and individuals with pre-existing liver or kidney conditions [49,50]. Overall, when used appropriately within prescribed limits, *Holarrhena antidysenterica* remains a safe and effective medicinal herb, reinforcing its significance in Unani medicine.

Conclusion

Inderjo Talkh (*Holarrhena antidysenterica*) holds immense therapeutic potential in Unani medicine, where it has been traditionally used for treating gastrointestinal disorders, dysentery, helminthic infections, and fever-related conditions. The plant, particularly its seeds and bark, is rich in bioactive alkaloids such as conessine, holarrhenine, and kurchicine, which exhibit antimicrobial, antidiarrheal, anti-inflammatory, and immune-modulating properties. These pharmacological attributes support the classical Unani claims of Inderjo Talkh's efficacy in maintaining digestive health, detoxifying the blood, and enhancing immunity. With the growing interest in evidence-based traditional medicine, further clinical and pharmacological studies are essential to establish standardized formulations, precise dosages, and potential synergistic effects with modern drugs. Integrating Unani principles with contemporary scientific research can unlock new therapeutic possibilities, ensuring safe and effective use of *Holarrhena antidysenterica* in modern healthcare. Inderjo Talkh remains a valuable medicinal herb in Unani medicine, with promising applications in gastrointestinal, metabolic, and infectious diseases. By combining traditional wisdom with modern research, its full potential can be harnessed, paving the way for natural, plant-based therapeutics in integrative medicine.

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