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Harnessing nature's bounty: A comprehensive review on the medicinal applications of *Lawsonia inermis*

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Abstract

Lawsonia inermis, commonly known as henna, has been valued for centuries for its diverse medicinal properties. The plant, native to regions of North Africa, the Middle East, and South Asia, holds cultural significance as a natural dye for body art and hair, but its applications extend far beyond aesthetics. This review explores the extensive traditional and scientific knowledge surrounding the medicinal use of *Lawsonia inermis*. The bioactive compounds present in this plant such as lawsone, tannins, and flavonoids, contribute to its various therapeutic effects. The plant is renowned for its anti-inflammatory, antioxidant, and antimicrobial properties, making it a valuable candidate for treating skin disorders, wounds, and infections. Topical applications of *Lawsonia inermis*, either as a paste or oil, have been traditionally used for wound healing, burns, and as an anti-pruritic agent. Moreover, this plant has demonstrated potential in hair and scalp care, exhibiting anti-dandruff and hair conditioning effects. The plant's antimicrobial properties extend to its traditional use in oral care, with studies suggesting its efficacy against common oral pathogens. In addition to dermatological applications, *Lawsonia inermis*, has shown promise in the management of various health conditions, including diabetes. Its hypoglycemic effects and possible role in improving insulin sensitivity warrant further investigation for its integration into diabetes management strategies. As we navigate the dual realms of cultural heritage and evidence-based medicine, this review highlights the need for further research to validate and optimize the medicinal applications of *Lawsonia inermis*, paving the way for its enhanced utilization in contemporary healthcare practice.

Keywords: *Lawsonia inermis*, antimicrobial, antidandruff, antidiabetic

Introduction

Lawsonia inermis, commonly known as Henna, is a plant of historical and cultural significance that extends beyond its renowned application as a natural dye for body art and hair. Originating from regions of North Africa, the Middle East, and south Asia, this plant has been deeply woven into traditional practices for centuries. Beyond its aesthetic allure, this plant has emerged as a botanical treasure with a spectrum of medicinal uses, captivating the attention of both traditional healers and modern researchers. The medicinal potential of *Lawsonia inermis* lies in its rich phytochemical composition, prominently featuring lawsone, tannins, and flavonoids. This unique combination of bioactive compounds has paved the way for a diverse array of therapeutic applications. From addressing skin-related concerns to contributing to oral health and potential systemic effects, *Lawsonia inermis* stands as a multifaceted herb in the realm of natural medicine. Historically this plant has been revered for its anti-inflammatory properties, making it a traditional remedy for skin conditions, wounds, and various dermatological issues. The plant's antioxidant and antimicrobial attributes have been harnessed in topical applications, showcasing its potential in wound healing and addressing microbial infections. Furthermore, this plant has found a place in hair care traditions, with documented evidence of its efficacy in managing dandruff and improving hair quality. Its application in oral care, supported by antimicrobial actions against common oral pathogens, adds another layer to its medicinal repertoire. As we delve into the medicinal applications of this plant, the integration of traditional wisdom and contemporary scientific scrutiny becomes paramount. This review seeks to unravel the intricate tapestry of *Lawsonia inermis*'s medicinal potential, shedding light on both its historical uses and the evolving landscape of scientific exploration. By doing so, we aim to provide a comprehensive understanding of the therapeutic dimensions of this plant, encouraging continued research and appreciation for its role in holistic well-being.

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Taxonomical classification

Kingdom- Plantae
 Phylum- Tracheophyta
 Class – Magnoliopsida
 Order – Rosales
 Family – Lythraceae
 Genus – *Lawsonia*
 Species – *inermis*

Synonyms: *Lawsonia alba*, *Lawsonia spinosa*, *Alcanna spinosa*, *Casearia multiflora*

Vernacular Names

Language	Name
Bengali	Mehadi, Mehandhi, Mendi
English	Henna Plant, Cypress Shrub
Gujarati	Mehandi
Hindi	Mehanthi
Kannada	Cromi
Malayalam	Mylanchi
Marathi	Mehendi
Sanskrit	Madayanthika
Tamil	Imbanam, Aimbanam, Mylanchi chedi
Telugu	Goranta

Plant description

Lawsonia inermis, commonly known as henna or hina, is a flowering plant that holds cultural, cosmetic, and medicinal significance. It is a relatively small shrub or tree, typically reaching a height of 1.8 to 7.6 meters (6 to 25 feet). The leaves are opposite, simple, and elliptical, with a smooth surface and a pale green color. They are about 2 to 4 cm long and possess a distinct, slightly wavy margin. The bark of the henna plant is greyish-brown and tends to peel as the plant ages. Flowers: Henna produces fragrant, small, white, pink or yellowish flowers. They are typically four-lobed and grow in clusters at the terminal ends of the branches. Fruits: The plant bears small, brown capsules containing numerous seeds.

Parts used: Leaves, Flower, Seed

Chemical constituents

The major coloring material present in henna is Lawsone (2-hydroxy-1:4 naphthaquinone) obtained from the leaves. The other compounds present in the leaves are: 1, 4-dihydroxynaphthalene, 1,4- naphthoquinone, 1,2-dihydroxy-glucyloxynaphthalene and 2-hydroxy-1,4-diglucoxyloxynaphthalene. Flavonoids (luteolins, apigenin, and their glycosides). Coumarins (esculetin, fraxetin, scopletin). Steroids (β sitosterol). It also contains gallic acid, hennatannic acid, olive oil green resin, glucose, mannitol, fats, resin (2%), mucilage and traces of an alkaloid. The Bark contains naphthoquinone, isoplumbagin, triterpenoids-Hennadiol, aliphatics (3- methylnonacosan-1-ol. The Flowers contain an essential oil (0.01-0.02%) with brown or dark brown colour, strong fragrance and consist mainly of α - and β - ionones; a nitrogenous compound and resin. The Seeds yield fatty oils (10- 11%) composed of behenic acid, arachidic acid, stearic acid, palmitic acid, oleic acid, linoleic acid. proteins (5.0%), carbohydrates (33.62%), and also fibres (33.5%),

Pharmacological Importance**Anti-Inflammatory Activity**

Lawsonia inermis exhibits anti-inflammatory effects, making

it a traditional remedy for skin inflammations and irritations. (Ziaei *et al.*, 2016; Imam *et al.*, 2013; Ramya *et al.*, 2005; Alia *et al.*, 1995; Gupta *et al.*, 1993; Gupta *et al.*, 1986; Singh *et al.*, 1982) [56, 27, 46, 5, 19, 20, 52]

Antioxidant Activity

The plant contains antioxidants that help neutralize free radicals, contributing to its potential in protecting the skin from oxidative stress. (Jafarzadeh *et al.*, 2015; Ling *et al.*, 2010; Endrini *et al.*, 2007; Hosein and Zinab, 2007; Prakash *et al.*, 2007; Rahmat *et al.*, 2006; Wang *et al.*, 2007; Mikhaeil *et al.*, 2004; Dasgupta *et al.*, 2003) [28, 31, 17, 25, 44, 45, 54, 34, 15]

Antimicrobial Activity

Lawsonia inermis has demonstrated antimicrobial properties, suggesting its use in traditional medicine for treating microbial infections on the skin. (Yusuf, 2016; Babu and Subhasree, 2009; El- Hag *et al.*, 2007; Saadabi, 2007; Habbal *et al.*, 2005; Dama *et al.*, 1999; Baba-Moussa *et al.*, 1997; Singh and Pandey, 1989; Natarajan and Lalitha kumar, 1987; Tripathi *et al.*, 1978; Malekzadeh, 1968) [55, 11, 16, 47, 21, 14, 10, 51, 39, 53, 33]

Wound Healing Activity

The paste made from *Lawsonia inermis* leaves is traditionally applied topically to wounds and burns to promote healing. (Galehdri *et al.*, 2016; Nayak *et al.*, 2007; Muhammad and Muhammad, 2005; Sakarkar *et al.*, 2004; Hamdi *et al.*, 1997) [18, 40, 36, 48, 22]

Dermatological Conditions

Henna is used traditionally for various skin conditions, such as eczema and psoriasis, to alleviate symptoms and promote skin health. (Al-Mehna and Kadhum, 2011; Dasgupta *et al.*, 2003; Natarajan *et al.*, 2000) [6, 15, 38]

Hair Care

Lawsonia inermis is widely used for hair colouring and conditioning. It is believed to strengthen hair, reduce dandruff, and improve overall hair health. (Jallad and Jallad, 2008) [29]

Anti-Dandruff Activity

The antimicrobial properties of *Lawsonia inermis* make it a traditional remedy for addressing dandruff and maintaining scalp health. (Natarajan and Lalithakumar, 1987) [39]

Oral Care Activity

Henna has been used in traditional oral care for its potential antimicrobial effects against common oral pathogens. (Babu and Subhasree, 2009; Baba-Moussa *et al.*, 1997) [11, 10]

Cooling Effect

Lawsonia inermis is believed to have a cooling effect, making it useful in traditional applications for conditions associated with heat and inflammation. (Alia *et al.*, 1995, Gupta *et al.*, 1993) [5, 19]

Anti-pruritic Activity

The paste or oil derived from *Lawsonia inermis* is applied traditionally to relieve itching and skin discomfort. (Al-Mehna *et al.*, 2011) [6]

Potential in Diabetes Management Activity

Some studies suggest that *Lawsonia inermis* may have hypoglycemic effects, indicating a potential role in diabetes management. Further research is needed to fully understand its implications. (Singh *et al.*, 2015; Mutluoglu and Uzun, 2009; Abdillan *et al.*, 2008; Arayne *et al.*, 2007) ^[50, 37, 2, 9]

Hepatoprotective Activity

Reports are available in the hepatoprotective activity of different solvent extracts of *Lawsonia inermis* and was found that the active principle found in this plant showed significant result against liver injury and other related hepatic problems. (Hasan *et al.*, 2016; Hsouna *et al.*, 2016; Mohamed *et al.*, 2015; Philip *et al.*, 2011; Sanni *et al.*, 2010; Latha *et al.*, 2005; Hemalatha *et al.*, 2004; Bhandarkar and Khan, 2003; Anand *et al.*, 1990, 1992; Ahmad *et al.*, 2000) ^[23, 26, 35, 42, 49, 30, 24, 12, 8, 7, 3]

Anti-cancer Activity

Clinical studies were carried out in experimental organisms to examine the cytotoxic effect of different extracts of *Lawsonia inermis* and was found that the chemical compounds isolated from this plant showed anti-tumour activity and significant reduction in cell number and its growth (Abdel Hamid *et al.*, 2015; Li Q *et al.*, 2014; Pradhan *et al.*, 2012; Ling *et al.*, 2010; Ozaslan *et al.*, 2009; Endrini *et al.*, 2007; Wang *et al.*, 2007; Rahmat *et al.*, 2006; Dasgupta *et al.*, 2003; Ali and Grever, 1998; Chang and Suzuka, 1982) ^[1, 32, 43, 31, 41, 17, 54, 45, 15, 4, 13]

Conclusion

The review of the medicinal use of *Lawsonia inermis*, commonly known as Henna, illuminates the multifaceted nature of this botanical marvel. Rooted in centuries of traditional knowledge and cultural practices, this plant has transcended its role as a cosmetic and artistic agent as a valuable contributor to natural medicine. The diverse bioactive compounds within this plant particularly lawsone, tannins and flavonoids, underpin its myriad therapeutic properties. Its anti-inflammatory, antioxidant, and antimicrobial characteristics have been harnessed traditionally for skin care, wound healing, and combating various dermatological ailments. The topical application of this plant, whether in the form of a paste or oil, stands as a testament to its efficacy in promoting skin health. Beyond dermatological applications, this plant has showcased its versatility in hair care, with documented evidence supporting its anti-dandruff effects and hair conditioning properties. Additionally, its antimicrobial actions extend to oral care, suggesting potential benefits in managing common oral pathogens. The exploration of *Lawsonia inermis* in the context of systemic health, particularly its implications for diabetes management, adds a new dimension to its medicinal profile. The plant's hypoglycemic effects and potential role in improving insulin sensitivity present exciting avenues for further investigation into comprehensive healthcare strategies. As we navigate the juncture of tradition and modernity, the review emphasizes the need for continued research to validate and optimize the medicinal applications of this plant. Bridging the gap between age-old practices and evidence-based medicine is essential to unlock the full therapeutic potential of this plant. By recognizing *Lawsonia inermis* not only as an artistic medium but also as a valuable contributor to holistic well-being, we pave the way for its enhanced utilization in contemporary

healthcare practices. This synthesis of tradition and science marks this plant as a botanical treasure deserving of ongoing exploration and appreciation in the broader landscape of natural medicine.

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