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REVIEW ARTICLE

Lawsonia inermis: An Ancient Skin Care Herb and its Scientific Validation as Antifungal Agent

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ABSTRACT

Around the globe, fungus-related skin disorders are a widespread public health issue, and are still an unsolved health issue, mainly due to the fact that the available antifungal drugs are of limited effectiveness. *Lawsonia inermis* L., or henna, is a popular herb for cosmeceutical uses in Indian traditional systems of medicine and rituals. Hence, the present study was conducted to evaluate the phytochemical constituents and antifungal potential of henna leaves. All of the tested pathogens were significantly inhibited by the leaves methanol extract, which also revealed the presence of many active phytochemicals.

KEYWORDS

• Menhendi • Henna • Antifungal drug • Medicinal plant • Dermatophytes

INTRODUCTION

Skin is vulnerable to several microbial attacks. Consequently, approximately 80% of people with skin issues might not seek medical attention for their conditions. According to many research, fungal infections such eczema, ringworm, candidiasis, and dermatitis are more common in extreme climatic conditions and spread by contact with infected people.[1] Furthermore, the majority of peoples do not consider skin disorders to be severe due to their low socioeconomic condition.[2] This ignorance leads to more complications in treating fungal infections.

Fungal-associated skin infections are also known as "mycoses." In terms of cellular similarity, fungi are eukaryotic microorganisms that are closer to humans than bacteria. Contact with an infected person, animal, or object can result in the spread of various fungal infections on an individual's skin. Fungal diseases are more common in

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older people, diabetics, and people with immunocompromised. The treatment of mycoses is more challenging because both fungi and their hosts are eukaryotic, making it more challenging to choose an intracellular drug target that is specific to the pathogen and does not harm the host. Among the common invasive fungal pathogens are *Aspergillus fumigatus, Cryptococcus neoformans, Trychophyton spp.,* yeast as *Candida spp.,* and dermatophytes, which include *Trichophyton* species, *Epidemophyton* sp., and *Microsporum spp.,* which are the most common types of fungi that cause skin diseases in humans.[2,3]

Historical significance and the need of the hour

The current situation, with numerous drug resistances and a shortage of antifungal medications, has prompted research into novel antifungal agents from alternative sources, like medicinal plants. In order to address this issue, Ayurveda and skin care are becoming more and more associated in the wellness, health, and beauty industries. Some Indian plants, like Neem, Menhendi and Haldi paste are known from centuries for their cosmetic and remedial uses, have already been adopted by modern medicine around the world. In addition, the Henna or Menhendi is scientifically known as *Lawsonia inermis* L., is traditionally used to dye hands, feet, and hair crimson or black for special events like Indian weddings and religious celebrations. Moreover, the diverse uses of this plant are described in ancient text and history of India, for its considerable role as a symbol of joy, beauty and sacred rituals in Hindu culture. According to an ancient phrse as "Madayanti Laghu Ruksha Kashaya Tiktsheetla, Kapha pitta Prashamini Kushtaghni Sa Prakirtita." it is mention in Ayurveda as the sanskrit name of 'Madayantika' is one of such drugs explained in Dravyaguna (An chapter of Ayurveda) which is useful in both disease condition and cosmetic purposes, due to its healing (Ropan) properties and cold (Shita virya) potency. Similarly, this herb is also recommended for the treatment of epilepsy and jaundice in Charaka Samhita, and Sushruta Samhitaa (Ancient text) has been recommended for malignant ulcers.[4,5]

Ethno-Medicinal Uses

The whole plant, including the roots, stems, leaves, flower pods, and seeds, is used as a paste or decoction to treat wounds, burns, rashes, itching, allergies, and skin irritations. Moreover, leaves in the form of paste have been employed externally for treating headaches and burning feet. Leaves decoction is prescribed for sore throats as a gargle. Mehndi is also used as a natural coloring that encourages hair development and provides conditioning luster, as well as hair care in cases of dandruff. In addition, the essential oil isolated from the henna flowers is used in perfumery due to its β-ionone content.[6]

Figure 1: *Lawsonia inermis* L. plant

MATERIALS AND METHODS

Lawsonia inermis is a member of the Lythraceae family and is grown in dry tropical and subtropical regions such as Morocco, Yemen, Iran, Sudan, Libya, North Africa, India, Sri Lanka, and Pakistan.[6] The plant is a glabrous shrub with numerous branches that are capped with spines. It grows to a height of 2–4 meters. The leaves are arranged in pairs, complete, glabrous, sub-sessile, oval, and broadly lanceolate, with depressed veins on the dorsal surface. Flowers contain four sepals and obviating petals. The calyx tube's rim is adorned with pairs of white or red stamens. Fruits are tiny, brownish capsules that have an uneven opening pattern and measure 4–8 mm in diameter.[7]

VERNACULAR NAME

English - Henna; Hindi - Mehendi; Gujarati - Mehndi; Kannada - Madarangi, Goranti; Malayalam - Mailanchi; Marathi - Mendi; Sanskrit: Madayantika; Tamil - Marudani, Abnam; Telugu - Kuravamum.

PROCESSING AND EXTRACTION

L. inermis plant leaves that were healthy and free of disease were freshly collected from the field and given a thorough washing under running tap water, dried in the shade, then ground into a powder and kept for later extraction in airtight receptacles. Furthermore, different solvents, such as acetone, methanol, hexane, and aqueous, were used as per their polarity index. The extraction was carried out by Soxhlet extraction at the boiling point of the solvent for a duration of 12–18 hours. Moreover, for the aqueous extract, the infusion was prepared in distilled water (1:4) for 48 hours at room temperature, followed by maceration and filtration. All the extracts were evaporated in a water bath, and the residue was stored at 4 ^{o}C in a refrigerator.

Test organism: The fungal isolates viz. *Candida krusei, Candida glabrata, Candida parapsilosis* and *Cryptococcus neoformans* were obtained from Medical Mycology Laboratory, R. D. University, Jabalpur (M.P.), and three strains, i.e. *Aspergillus niger* (MTCC 10188), *Candida albicans* (MTCC 1637), and *Trycophyton rubrum* (MTCC 8477) were procured from the Microbial Type Culture Collection (MTCC) of the Institute of Microbial Technology, Chandigarh.

Antifungal Assay

The antifungal activity was observed by agar-well diffusion technique. The plant extracts (10 mg/ml) were filled into wells, and pure solvents were used as control, while Fluconazole was used as standard drug. The diameters of any clear zones surrounding the samples and drug-containing wells were measured using an antibiotic zone reader (Himedia) following the incubation period (based on the types of organisms). Three duplicates of each test were run.

Phytochemical Screening

Plant extracts offer insight into the type of metabolites found in that specific extract, which aids in selecting for the further active compounds studies.[8] Based on the outcomes of the antifungal screening, a solvent extract of *L.inermis* leaves was chosen, and phytochemical investigations were carried out using the GC-MS technique for both quantitative and qualitative analysis.[9]

RESULTS & DISCUSSION

Out of the various solvent extracts tested, only the methanol extract of the plant leaves demonstrated significant activity against all tested pathogens, with the zone of inhibition ranging from 10.66 to 25. 66mm. Aqueous extract of this plant also demonstrated moderate activity against two fungal species i.e. *C. albicans* and *C. krusei* (Table.1). The Minimum inhibition concentration (MIC) was also recorded at 5 µg/ml with an inhibition zone 9.0 mm against *C. albicans* and *C. krusei*, as compared to the inhibition zone revealed by the standard drug Fluconazole (10mm).

Table 1: Antifungal activity in terms of Zone of Inhibition (ZOI in mm)

Tested Pathogens	Methanol (mean value in millimeter)	Aqueous (mean value millimeter)
Candida albicans	18.00±0.00	17.33±0.57
Candida glabrata	22.66± 0.57	0
Candida krusei	25.66± 1.15	10.66±0.57
Candida parapsilosis	20.0±1.00	0
Aspergillus niger	18.00±1.00	0
Cryptococcus neoformans	17.00±0.00	0
Trichophyton rubrum	10.66±0.57	0

According to preliminary qualitative phytochemical screening, the methanol

extract contained phytosterols, terpenoids, tannins, fatty acids, and glycosides. The GC-MS chromatogram revealed predominating components as Squalene (19.77%); 9,12,15-Octadecatrienoic acid, (Z,Z,Z)-(14.90%); Pentadecanoic acid (10.54%); 9,12,15-Octadecatrienoic acid, methyl ester (Z,Z,Z)-(11.52%); Vitamin E (6.82%); 9,12-Octadecadienoicc acid (Z,Z)-, (3.Beta.)-(5.67%); Hexadecanoic acid, methyl ester (5.85%); Methyl ester (4.98%); Stigmast-5-En-3-Ol and phytol (1.77%), were present in leaves methanol extract.[10] The phytochemical content of *L. inermis* may make it more soluble in these solvents than other solvents, as several studies have shown, making methanol a potentially superior solvent for plant extraction. Comparable antimicrobial outcomes of the plant methanol extract were also reported from the different studies.[2] It means that the organic solvent dissolve more and more active ingredients. The same reason is also supported by Cowan[11], who suggested that organic solvents could be better solvent for extraction.

CONCLUSION

Folkloric claims or traditional uses of *L. inermis* or henna as a remedy for topical skin diseases, skin care, and other infectious ailments are well-known. Thus, the varying degrees of antifungal activity displayed by the *L. inermis* leaves against the tested fungal pathogens justify this study in part. Furthermore, it is justified to conduct additional research on the plant or its components in order to isolate the active ingredients, optimize the formulation for topical delivery, and conduct toxicological studies.

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