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# Comprehensive review on *Madayantika* (*Lawsonia inermis* L.)

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## ABSTRACT

*Ayurveda*, Indian system of medicine is gaining importance throughout the world due to its novel healing approach. Nature has gifted us with abundant medicinal plants to create disease free and healthy life. *Dravyaguna* is one unique branch explained in *Ayurveda* which deals with herbal drugs along with their properties, action and its application in different diseases. *Madayantika* (*Lawsonia inermis* L.) is one such plant which is cultivated throughout India owing to its commercial value. It is a shrub with leaf, flower, roots and seeds as its useful parts. It is mainly useful in *Kustha* (Skin diseases), *Kamala* (Jaundice), *Shwitra* (Vitiligo), *Jwara* (fever), etc. It is also used as fungicidal, anti-inflammatory, antibacterial, analgesic and anticancerous effects. It is also known for its cosmetic use as a colouring agent for hair, nails, etc. Hence an effort is made to review the drug *Madayantika* (*Lawsonia inermis* L.)

**Key words:** *Ayurveda, Dravyaguna, Madayantika, Henna, Mehendi*

## INTRODUCTION

The basic concept of *Dravyaguna* explained in *Ayurveda* which involves the compilation of innumerable herbs with their *Nama Jnana* (Nomenclature), *Rupa Jnana* (Morphology) and *Gunakarma* (Properties and actions). The worldwide demand for natural dyes is now a days of great interest due to increased awareness on therapeutic properties of dyes. Natural dyes are derived from naturally

occurring sources such as plants, insects, animals, and minerals. Several synthetic colourants have been banned because they cause allergy like symptoms or are carcinogens. Although known for long time for dying as well as medicinal properties, the structure and protective properties of natural dyes have been recognized only in the recent past. Many of the plants are used for dye extraction.<sup>[1]</sup> *Madayantika* is one of such drugs explained in *Dravyaguna* which is useful in both disease condition and also used for cosmetic purpose. It is botanically identified as *Lawsonia inermis* L. belonging to the family of Lythraceae. It is widely used as a colouring agent. Henna commonly being known as lawsone or hennotannic acid, a red-orange pigment, is the chief constituent of henna leaves.<sup>[2]</sup> This plant is a small elegant bush indigenous to India and is often cultivated as a source of Henna for cosmetic purpose. It is widely used in a variety of religious and ritualistic ceremonies of Hindu and Muslim communities in India.<sup>[3]</sup> It is also ingredients in many hair colouring formulations. This article is made to compile the literary review on the drug *Madayantika*.

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**MATERIALS AND METHODS**

**Botanical name** - *Lawsonia inermis* L. Syn. *Lawsonia alba*<sup>[4]</sup>

**Family** - Lythraceae

**Nirukti** - *Madayantika* cures insanity and intoxication.<sup>[5]</sup>

It imparts red colour to the nails and hence commonly called Mehendi.<sup>[6]</sup>

**Paryaya**<sup>[7]</sup>

*Raktharanga* - Imparts red colour when applied.

*Dahahantri* - It helps in relieving from burning sensation.

*Yavanestada* - Liked by Europeans.

*Ragangi* - Imparts attractive colour.

*Rakthagarbhi* - Contains red colouring pigment in it.

*Nakharanjani* - Imparts colour to the nails if applied.

*Medhini* - Acts as memory enhancer.

**Vernacular names**<sup>[8]</sup>

English - Henna

Hindi - Mehendi

Kannada - Madarangi, Goranti

Malayalam - Mailanchi

Marathi - Mendi

Telugu - Goranta, Kuravamum

Tamil - Marudani, Abnam

Gujarati - Mehndi

**Part used**<sup>[9]</sup> - *Patra* (Leaf), *Pushpa* (Flower), *Mula* (Roots) and *Beeja* (Seeds)

**Habitat** - It is indigenous to India and dwells very well in tropical and subtropical region of the country and is often cultivated as a source of Henna for cosmetic purposes.<sup>[8]</sup> Indigenous in Arabia and Persia.<sup>[10]</sup>

**Morphology**<sup>[10]</sup>

A glabrous much-branched shrub. Young branches sometimes 4-gonous, the older terete, often

spinescent. Lateral branches 4-gonous, often ending in a spinous point.

Leaves opposite, shortly petiolate, ovate-lanceolate, entire, elliptic or broadly lanceolate, acute or obtuse, often mucronate, base tapering; petioles very short or 0.

Flowers numerous in terminal paniced cymes. Calyx-tube short, lobes 4, spreading, broadly ovate. Petals 4, very shortly clawed, inserted at the top of the calyx tube, less than 1.3 cm. across, fragrant, white or rose-coloured, in large terminal pyramidal paniced cymes; pedicels short, slender. Calyx 3-5 mm. long, broadly campanulate; lobes 2.5-3 mm. long, ovate, acute. Petals. Stamens 8 (rarely 4), inserted at the base of the calyx-tube in pairs opposite the calyx-lobes; anthers broadly oblong. Ovary subglobose, 2-4-celled; ovules many, placentas axile; style thick, slightly longer than the stamens; stigma capitate.

Capsule globose, 6 mm. diameter, stalked in the base of the calyx-tube, coriaceous, irregularly breaking up, ultimately 1-celled. It is slightly veined outside, supported by the persistent calyx and tipped with the style.

Seeds closely packed on a central placenta, angular, pyramidal. They are trigono-pyramidal, about 2.5 mm. long, externally subtuberculate.

**Microscopy**<sup>[11]</sup>

**Petiole** - shows concavo-convex outline. Epidermis consisting of single layered cells covered by thick, striated cuticle; below epidermis 2 to 4 layered collenchyma and 3 to 4 layered parenchyma having intercellular spaces; pericycle 2 to 4 layered, stele bicollateral; cambium a thin strip presents between xylem and phloem; phloem consisting of usual elements. Xylem mostly composed of tracheids and vessels.

**Midrib** - shows upper and lower epidermis covered externally by thick and striated cuticle; epidermis followed by 2 to 4 layers of collenchymatous cells, circular in shape with angular thickening beneath which are 3 or 4 layers of parenchymatous cells, isodiametric with intercellular spaces; stele crescent-

shaped, consisting of usual elements traversed by medullary rays; phloem fibres seen in the phloem region; a few parenchymatous cells contain rosette and prismatic crystals of calcium oxalate.

**Lamina** - shows upper and lower epidermis composed of tangentially elongated cells covered externally by a thick striated cuticle; some large epidermal cells form mucilage sacs projecting into adjacent palisade zone; anomocytic stomata distributed on both surfaces; mesophyll composed of 1 to 3 layers of palisade tissue and 2 to 4 layers of spongy parenchyma; palisade cells filled with chloroplasts, spongy parenchyma oval to circular in shape, oil globules present in palisade and spongy parenchyma; rosette and prismatic crystals of calcium oxalate also present in spongy parenchyma; mesophyll traversed by vascular strands composed of xylem surrounded by phloem with a patch of sclerenchymatous fibres on abaxial side. Average stomatal index 10 to 15 and 15 to 18 in upper and lower surface the respectively. Palisade ratio 5 to 8 on both surfaces; vein islet number 30 to 45.

**Powder** - Dark brown; shows fragments of thin-walled, parenchyma cells, wavy thin-walled epidermal cells in surface view, anomocytic stomata, rosette and prismatic crystals of calcium oxalate, a few oil globules and vessels showing spiral thickenings.

**Rasa Panchaka**<sup>[7]</sup>

**Rasa (Taste)** - *Kashaya* (Astringent), *Tikta* (Bitter)

**Guna (Properties)** - *Laghu* (Lightness), *Ruksha* (Dryness)

**Veerya (Potency)** - *Sheeta* (Cold)

**Vipaka (Biotransformation)** - *Katu* (Pungent)

**Karma (Action)** - *Shoshaka* (Adsorbent), *Kushtaghna* (Prevents skin diseases), *Kandughna*, (Antipruritic), *Jwarahara* (Antipyretic), *Dahahara* (Reduces burning sensation), *Vranahara* (Wound healing).

**Doshaghnata** - *Kaphapitta Shamaka*

**Phytoconstituents** - Lawsone, Esculetin, Faxetin, Isoplumbagin, Scopoletin, Betulin, Betulinic acid, Hennadiol, Lupeol and its related compounds like lacoumarin, laxanthone I, II and III. Flavone glycosides,

two Pentacytic triterpenes are the chief components reported from the various parts along with components of essential oil and seed oil.<sup>[9]</sup>

The leaves and stem bark contains Lawsone (2-hydroxy 1,4- naphthaquinone) and Polyphenolic compounds like Lalioid, Lawsoniaside B, Daphneside, argimonolide, gallic acids, etc. Stem bark, seeds and the essential oils from the leaf and flower contains Terpenes and terpenoids like 30-dehydroxylupane, Lupeol, Betulin, Betulinic acid, etc. Whole plant contains Xanthones (Laxanthone 1, Laxanthone 2 and Laxanthone 3), Bezopyrone (Fraxetin) and other chemical constituents like carbohydrates, proteins, fibres and trace metals like Copper, Nickel, Manganese, etc. The leaves contain flavonoids like Quercetin, Apigenin, Luteoline, etc.<sup>[3]</sup>

**Pharmacological actions**<sup>[9]</sup>

**Root:** The roots are refrigerant, depurative, diuretic, emmenagogue, abortifacient and trichogenic.

**Leaves:** Leaves are refrigerant, vulnerary, diuretic, emetic, expectorant, anodyne, anti-inflammatory, constipating, depurative, liver tonic, haemotonic, styptic, febrifuge and trichogenic.

**Flowers:** Flowers are intellect promoting, cardiotoxic, refrigerant, soporific, febrifuge and tonic.

**Seeds:** Seeds are antipyretic, intellect promoting and constipating.

**Pharmacological activity**<sup>[3]</sup>

Anti-inflammatory study, antimicrobial activity, Antioxidant activity, Wound healing activity, Antitumor activity and cytotoxicity, Analgesic activity, Antipyretic activity, Antidiarrheal activity, Hepatoprotective activity, Diuretic activity, Immunomodulatory activity, Hypoglycemic activity, Bone reabsorption activity, Antiparasitic activity.

**Rogaghnata**<sup>[12]</sup>

*Kushta* (Skin diseases), *Prameha* (Diabetes mellitus), *Raktapitta* (Bleeding disorder), *Kamala* (Jaundice), *Raktatisara* (Hematochezia), *Hridroga* (Cardiac disorders), *Mutrakrichra* (Dysurea), *Bhrama*

(Giddiness), *Vrana* (Ulcer), *Atidaha* (Burning sensation).

#### Amayika Prayoga

1. *Prameha* (Diabetes mellitus) - In *Raktameha*, paste of *Madayanti* mixed with honey should be taken with cold water.<sup>[13]</sup>
2. *Raktapitta* (Intrinsic hemorrhage) - Cooled decoction of *Madayanti* root is added with sugar and honey checks intrinsic haemorrhage.<sup>[14]</sup>
3. *Rajyakshma* (Tuberculosis) - *Madayanti* is taken with root, flower, leaves and tender leaves for 1 month continuously will be useful in *Rajyakshma*.<sup>[15]</sup>
4. *Yoniroga* - The leaves of *Vasa* (*Adhatoda vasica* Linn.), Roots of *Matulunga* (*Citrus medica*), leaves and seeds of *Madayantika* and *Pippali Kunjika* is taken in equal quantity along with *Saindhava Lavana* (Rock salt) and *Madya* helps in relieving *Yonishoola* (Gynecological disorders).<sup>[16]</sup>

#### Formulations

1. *Mahaneela Taila* in *Palitya* (Greying of hair) and all types of *Shirorogas* (Head diseases) especially *Palitya*.<sup>[17,18]</sup>
2. *Mahapanchagavya Ghritha* (Ghee) is indicated in *Shwayathu* (Edema), *Gulma* (tumour) *Udara* (Ascitis), *Arshas* (Haemorrhoids), *Pandu* (Anaemia), *Kamala* (Jaundice), *Haleemaka* (advanced form of Jaundice), *Graharoga* (Diseases caused by microbes) and *Chathurthaka jwara* (Pyrexia).<sup>[19]</sup>
3. *Mahapadma taila* (oil) indicated in *Vatarakta* (Gouty arthritis) and *Jwara* (Pyrexia).<sup>[20]</sup>
4. *Madayantika Churna* (Powder) in *Twak Vikara* (Skin diseases).<sup>[7]</sup>
5. *Madayanti Kashaya* (Decoction) is indicated in *Yoniroga* (Gynecological disorders).<sup>[21]</sup>

#### Ethnomedicinal use

*Lawsonia inermis* Linn. is used medicinally in Indo China, the Philippine Islands, French Guiana, West and North Africa.

**Leaf:** The leaves have a bitter bad taste. The leaves are emetic, diuretic and an expectorant. It favour the growth of the hair. It is useful in headache, lumbago, bronchitis, boils, ulcers, stomatitis, ophthalmia, syphilitic sores, amenorrhea, scabies, leukoderma, diseases of the spleen. The leaf paste is applied externally in case of Headache. The fresh leaves are made into paste using Vinegar and rubbed over the feet in case of burning feet. In Annam, the leaves are used in the treatment of leprosy, jaundice, and more especially herpes. The aqueous infusion of the leaves applied to the external surfaces of the body was used as a prophylactic against certain skin diseases which are quite prevalent in the eastern tropical and semi-tropical countries. Paste of the leaves applied to prevent skin inflammation, diarrheal infusion and renal lithiasis, while leaf decoction was found useful in wound cleaning and healing.<sup>[10]</sup> Traditional users used Henna leaves to treat bacterial infection and burn wound.<sup>[3]</sup> Henna was extensively used for dyeing silk and wool.<sup>[22]</sup>

**Seed:** The seeds are antipyretic and helps in treating insanity (*Ayurveda*). The seeds are tonic to the brain (Yunani).

**Bark:** The bark is given in jaundice and in enlargement of the spleen. The decoctions are applied to burns, scalds, etc. The decoction of the bark is given as an emmenagogue in Guinea.

**Flower:** The flowers are placed under the pillow for soporific action. The infusion of the flower cures headache. The oil and essence are rubbed over the body to keep the body cool. In the Konkan, the leaf-juice mixed with water and sugar is given as a remedy for spermatorrhea, and with milk in the condition known as "hot and cold fits." An infusion of the flowers is given for headache, and is a good application to bruises. Poultice of the bruised leaves, or fomentation with an infusion of the leaves, are much employed as a local application to braises, sprains, and other diseases. An extract prepared from the leaves and flowers is given in leprosy. The flowers of the plant are still used in preparing a delicate highly esteemed perfume of the East.

**Root:** The decoction prepared from the roots are used as an abortifacient. In Cambodia, the roots are considered diuretic. They are given in gonorrhoea and in bronchitis. The root of the henna plant was upheld as a specific in leprosy and also in drying up certain ulcers of the mouth and gums.

**Fruit:** The fruit is claimed to be emmenagogue.

The primordial use of henna appears to have been more a matter of hygiene than that of augmenting beauty. Another property of this infusion was said to be that of producing a cooling sensation to the part applied, acting gently on the sweat-glands, reducing their activity, benefiting both health and comfort.<sup>[10]</sup>

**Dose<sup>[8]</sup>**

**Leaf juice:** 5-10 ml

**Leaf powder:** 1-3g

**Controversy -** Dalhana has commented *Trayantika* as *Madayantika* in *Prameha Chikitsa*.<sup>[23]</sup> Hemadri had mentioned *Madayantika* as *Yuthika* (*Jasminum auriculatum* Vahl) in the commentary of *Raktapittahara Kashaya*.<sup>[24]</sup> Bhavamishra<sup>[25]</sup>, Shodala Nighantu<sup>[26]</sup>, Nighantu Shesha<sup>[27]</sup>, Dhanwantari Nighantu<sup>[28]</sup>, Abhidana Manjari<sup>[29]</sup>, Hridaya Deepika Nighantu<sup>[30]</sup> and Madanapala Nighantu<sup>[31]</sup> has mentioned it as a synonym for *Mallika*. Indu has commented *Alambusha* (*Bryophytum sensitivum*) as *Madayantika* in *Kushtha Chikitsa* as a *Rasayana Dravya*<sup>[32]</sup> and also *Dhataki* (*Woodfordia fruticosa*) as *Madayantika* in *Pittaja Mukharoga*<sup>[33]</sup>. Astanga Nighantu had mentioned it as *Dhataki*.<sup>[34]</sup> Even though different sources are mentioned as *Madayantika* in the classics, by considering its property of colouring property, it can be clearly identified as *Lawsonia inermis* L.

**Adulterants and substitutes<sup>[9]</sup>** - Leaves are sometimes adulterated with leaves and twigs of other shrubs. Henna powder is adulterated with different organic and inorganic articles like sand, stems and fruits of henna plant and husks of paddy *Oryza sativa* L. and moong *Vigna mungo* (L).

**Propagation and cultivation** - Plant grows on any type of soil, from light loam to clay loam, but does best on heavy soils which are retentive of moisture. It tolerates little alkalinity in the soil. Propagation is done by seeds and cuttings. Seeds are sown in nursery beds kept flooded with water for some days before sowing. They are first soaked in water for 20-25 days with frequent changes of water for sprouting and then sown in March-April. When seedlings are 1.5 to 2 ft high, they are transplanted in the field (in July-August) after cutting out roots and shoots. They may be planted singly or 2-3 together in holes at a spacing of 30 cm in irrigated lands and 18 cm in unirrigated lands. Daily irrigation is necessary in the initial stages. Nothing is taken from the first-year crop, but afterwards double crop is yielded every year, one in April- May and the other in October – November.<sup>[9]</sup> Henna produces maximum dye content in summer when the temperature ranges between 35°C- 45°C.<sup>[3]</sup>

**Toxicity** - Four extracts of the drug were found to be nontoxic. Lethal Dose of the extract was more than 1000 mg/kg.i.p. in albino mice. Among the plants causing dermatitis, the drug was found to give a positive patch test in only 1 out of 6 patients tested<sup>[9]</sup> An acute oral toxicity study of Henna root was performed in the Sprague- Dawley Rat according to the OECD Guidelines N 401(1981). The calculated oral median lethal dose was >2000 mg/kg bw. An acute dermal toxicity study of Henna root was conducted in Wistar rats according to OECD Guidelines 402(1987). Median lethal dose for Henna root was >2000 mg/kg/bw. *Lawsonia inermis* showed no irritative potential for the skin after a single occlusive application for 24 hours in Wistar rats, when tested for acute dermal toxicity.<sup>[35]</sup> Skin irritation was not noticed when tested in Wistar albino rats for acute dermal toxicity. Teratogenicity- No clinical signs, no abortions and no mortalities were recorded in 100 pregnant Sprague Dawley rats administered with Henna Gastric lavage.<sup>[36]</sup>

## DISCUSSION

*Madayantika* is botanically identified as *Lawsonia inermis* L. It is called so because it destroys intoxication

or insanity. Authors of *Brahatrayi* as well as *Nighantu* have not mentioned it under any specific *Varga*. But the commentaries of *Brahatrayi* and *Nighantukaras* give different identity for this drug as *Yuthika*, *Trayantika*, *Dhataki*, *Alambusha*, *Mallika*, etc. *Brhatrayis* include this as an ingredient in *Mahapanchagavya Gritha*, *Mahaneela Taila*, etc. *Nighantukaras* have given this as a synonym of drugs like *Mallika*, *Alambusha* and *Dhataki*. Acharya Priyavrit Sharma has explained this drug in detail with synonyms and *Rasa panchaka* and *Karma*. This drug is mostly cultivated throughout India because of its commercial value. Mainly used in cosmetics as it imparts colour to the nails, skin and the hairs. The nails of Egyptian mummies are dyed using the leaves of Henna.<sup>[37]</sup> For this reason, it is also called as *Nakharanjani*, *Ragangi*, *Raktaranga* etc. It is mainly indicated in *Pittarakta Pradhana Vyadhi* because of its *Sheetha Veerya*. A randomized clinical study has shown the effect of application of Henna leaves in prevention of decubitus ulcers.<sup>[38]</sup> It is a plant also known for its colouring property. Its colouring action is mainly due to a pigment called Lawsone. A study using the dried aqueous herbal extracts of *Japa* (*Hibiscus rosa-sinensis*), *Jatamansi* (*Nardostachys jatamansi*), *Kushtha* (*Saussurea lappa*), *Amalaki* (*Emblia officinalis*), *Khadira* (*Acacia catechu*) along with powders of *Madayantika* (*Lawsonia inermis* L.) and Coffee (*Coffea arabica*) shown maximum colouring effect on sheep wool fibres as well as on human beings.<sup>[39]</sup> *Ayurveda* mainly deals with its therapeutic aspect than cosmetics.

## CONCLUSION

*Madayantika* is a drug botanically identified as *Lawsonia inermis* L. mentioned in *Samhitas*, *Nighantus* with various identities. *Madayantika* is used as a cosmetic for hair and nail colouring. It has been cultivated all over India due to its commercial value. It is used both in therapeutics and cosmetics. This drug is used in the treatment of *Pittapradhana Vyadhi*. It is indicated in *Kushtha* (Skin diseases), *Prameha* (Diabetes), *Raktapitta* (Bleeding disorder), *Daha* (Burning sensation), *Rajyakshma* (Tuberculosis), *Palitya* (Greying of hair), etc. Even though it is mainly

used in cosmetics, *Ayurveda* had explained it with many therapeutic indications.

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