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Taxonomic, Traditional and Medicinal Uses Study Belonged to the Plant Genus *Lawsonia inermis* L. [Henna]

Lina Hassaballa*, Asaad Ahmed*

Department of Biology, Faculty of Education, University of Khartoum, Khartoum, Sudan
Email: *sudalin18@gmail.com, *asaadalsiddig@yahoo.com

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Abstract

This work is a Taxonomic study based on genus *Lawsonia* L. in Tehama area, Albaha region—Saudi Arabia. It includes scientific description of the family Lythraceae and scientific classification of the species *Lawsonia inermis* L. The study aims to: 1) Identify *Lawsonia inermis* L. species in Tihama—Albaha region. 2) Determine the distribution and habits of the species *Lawsonia inermis* L. 3) Provide medicinal properties and local uses of *Lawsonia inermis* L. Botanical names and synonyms were updated. Vernacular names have been presented. Botanical description is determined depending on the vegetative of the plant. Flowers and fruits were characterized. The method was recorded due to Dr. Jacob Thomas, Herbarium Dept., College of Science, King Saud University [1]. Information about habitats and distribution was provided. The plant species has been illustrated by photos in its habitat. Chemical components, medicinal properties and local uses were included. The study revealed that *Lawsonia inermis* L. is widely spread throughout the study area and it has great medicinal importance, so it requires more comprehensive studies for identification. Therefore, more Biochemical studies on the effective chemical compounds are required for the medicinal importance of the plant. The results revealed that there were many medicinal properties and local uses of *Lawsonia inermis* L.

Keywords

Taxonomic, Lawsonia, Henna

1. Introduction

Lawsonia inermis is also known as (Henna tree), and it is a flowering plant (**Figure 1**) used for sole found which found in native of Northern Africa, Western and

Figure 1. *Lawsonia inermis* L. (Flowering Branch).

Southern Asia in semi-arid zones or tropical areas. The plant produces dye when grown in temperatures between (35˚C - 45˚C). During the onset of precipitation intervals, the plant grows rapidly; putting out new shoots then the growth subsequently slows. The leaves gradually yellow and fall during prolonged dry or cool intervals. Temperature below (5˚C) will kill the plant.

Henna was used for cosmetic (**Figure 2** & **Figure 3**) purposes in ancient India or Carthage as well as in other parts of North Africa. In traditional herbal medicine, Henna plant has been used for many years to treat several diseases. Medicinal plants are the source of natural products providing unlimited opportunity for new drugs and they are used as ethnomedicine in different countries around the world. *Lawsonia inermis* attained status of natural sources and potent antimicrobial agents [2].

The genus *Lawsonia* L., which represents the scope of this study, belongs to family Lythraceae.

2. Lythraceae

It is a family of flowering plants, including about (620) species in (31) genera [3]. The family has a worldwide distribution with most species in tropical areas [4].

Plants are most often herbs and have fewer shrubs or trees; the shrubs and trees often have flaky barks. Traits shared by species within the Lythraceae distinguished them from other plant families, the petals being crumpled in the bud (**Figure 4**) and many layered outer integument of the seed [5]. Leaves generally, have opposite arrangement, but sometimes are whorled or alternate, simple with smooth margins and pinnate venation, stipules are typically reduced [6]. Flowers (**Figure 1**) bisexual, radially or occasionally symmetric with a well-developed hypanthium. Sepals may be distinct, partially fused to form a tube or touching without overlapping [7]. Petals are crumpled in the bud and wrinkled in maturity. Stamens usually are twice as many as petals, ovary typically superior, infrequently semi-inferior or rarely inferior. Two or many carpels can be fused together with two to numerous ovules with axile placentation [4].

Figure 2. *Lawsonia inermis* L. (Hand Decoration).

Figure 3. *Lawsonia inermis* L. (Hair Dye).

Figure 4. *Lawsonia inermis* L. (Flowering buds).

Genus *Lawsonia* L. bears one species, this is *Lawsonia inermis* L. [8]. *Lawsonia* has been used cosmetically and medicinally for over (9000) years. Leaves have an orange-red dye, and the leaves paste or powder (**Figure 5**) is widely used for decorating hands (**Figure 2**), nails, feet and hair dye (**Figure 3**). The main compound is lawsone 2-hydroxy-1,4-naphthoquinone [9]. Besides Lawsone, other constituents are presented such as: gallic acid, glucose, mannitol, fats, resin (2%), mucilage and traces of an alkaloid. Flowers yield essential oils with brown or dark brown colour in strong fragrance [10].

Figure 5. *Lawsonia inermis* L. (Leaves Powder).

Some pharmacological studies reported the medicinal properties of the plant such as: antidiabetic activity (ethanol extract) of *Lawsonia inermis* showed significant hypoglycaemic and hypolipidaemic activities in alloxan induced diabetic mice after oral administration [11].

The methanol extract from Henna leaves had displayed immune-stimulant action as indicated by promotion of T-lymphocyte proliferative response [12].

The comparison of methanolic extract of Henna leaves on drug metabolizing with synthetic antioxidant in the liver of Swiss Albino mice revealed that the hepatic glutathione-S-transferase and DT-diaphorase were elevated [13].

Lawsone which was isolated from the leaves of *Lawsonia inermis* has shown significant antifungal effect when aqueous extract of leaves was tested for antifungal potential against eight important species of Aspergillus which isolated from Sorghum, Maize and paddy seeds samples [14].

During an ethnopharmacological survey of antiparasitic medicinal plants used in Ivory Coast—(17) plants were collected and identified. Polar, non-polar and alkaloid extracts of various parts of these species were evaluated *in-vitro*, among the selected plants; *Lawsonia* L. showed interested trypanocidal activities [15].

Lawsone and its oxazine derivatives isolated from the leaves of *Lawsonia inermis* L. had proven to be potential anticoagulant agent [16].

The leaves of *lawsonia* L. have an orange-red dye and the leaf powder paste (**Figure 5**) widely used for hands decoration, nails, feet and hair dye (**Figure 3**). The paste is used for skin diseases. The flowers are very fragrant and are used to extract a perfume.

3. Methodology

3.1. Equipment and Tools

- Basket, plastic bags, knife and pair of scissors were used for collecting plant materials.
- A note book and pencil were used to record the information on habit, habitats, distribution and colour of fruits and flower.
- Camera was used to photograph plant samples in their habitats.

- A plant press made of alternating pieces of equal size of cartons, newspapers, rope were used to press dry plant specimens.

3.2. Plant Materials

Plant samples were collected from different places in the study area (20 species) through several trips, three trips per week. The species were collected manually in space of (15,000) km. (it is very rare) throughout the study area.

The plant samples were taken to the laboratory in the faculty of science in El-Mikhwa. The samples were examined using needles and hand lens.

3.3. Plant Samples Identification

Scientific names and synonyms were updated. Vernacular names were mentioned. The identified species were well dried and mounted in album with a card of identification including: date of collection, place, habit, habitats, scientific name and vernacular name, thereafter, left in the laboratory as a tiny herbarium.

4. Results

Scientific Classification:

Lawsonia inermis L. is the only species in the genus *Lawsonia* L. that belonged to the family Lythraceae, the scientific classification is as follows:

Kingdom: Plantae.

Division: Magnoliophyta.

Class: Magnoliopsida.

Order: Meyrtales.

Family: Lythraceae.

Genus: Lawsonia.

Species: *Lawsonia inermis* L.

The synonym and vernacular names are as follows:

Synonym: Lawsonia alba Lam.

Vernacular name: Henna.

Habitats: it grows mainly along watercourses and in semi-arid regions (**Figure 6**). It can withstand low air, humidity and drought.

5. Botanical Description

Dicot, shrub. Stems erect, brown, glabrous. Leaves simple, glabrous, sessile, opposite, lanceolate, margin entire, apex acuminate. Inflorescence cymose. Flowers white, hermaphrodite, actinomorphic, sepals (4), united, valvate, petals (4), free, twisted, stamens (8), united, found in pairs, epipetalous, ovary superior. Fruits brown capsules (**Figure 7**).

6. Chemical Properties

The principal colouring matter is lawsone-2-hydroxy-1,4-naphthoquinone beside other constituents: gallic acid, glucose, mannitol, fats, resin (2%), mucilage,

Figure 6. *Lawsonia inermis* L. (Whole Plant).

Figure 7. *Lawsonia inermis* L. (Fruits).

nitrogenous compounds and traces of alkaloids. Seeds contain proteins, carbohydrates, fibers, fatty oils, stearic acid, palmitic acid, behenic acid, arachidic acid, oleic acid and linoleic acid. Flowers (**Figure 1**) yield essential oils with brown or dark brown colour. Roots contain colouring matter [17].

7. Local Uses

Henna has been used since the Bronze Age for skin dye, hair, fingernails, leather,

silk and wool; also henna represents the colouring agent in many countries for textile industry.

Leaves, flowers, seeds, stem bark and roots are used in traditional medicine to treat variety diseases: skin diseases, fever, smallpox, headache, burns, leishmania (Table 1) and leprosy. The seeds of the plant are useful for relieving dysentery if it is powdered and mixed with ghee (Table 1). Flowers have the capacity to relieve headache caused by the sun in paste matter putting in forehead. Leave (Figure 5) paste should be made with water and applied to the affected area to relieve prickly heat.

Lalioside (2), luteolin-4'-O-β-D-glucopyranoside (3), apigenin 4'-O-β-D-glucopyranoside (4), luteolin (5), and apigenin (6) were isolated by preparative- and analytical-scale HPLC (Graph 1), and the materials were used for assessing IC50 values in antileishmanial activity assay, Table 2 [18].

8. Discussion

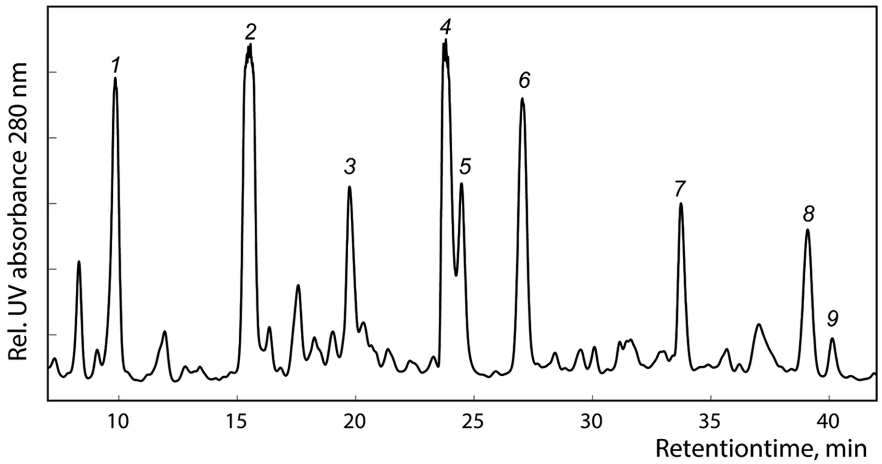
The local uses of Henna agree with that reported in India by [17] as a traditional herbal medicine. The importance of Henna trees is very obvious not only ecologically but also as medicinal plants (Table 1), the plant has been reported to have immuno-stimulant, antiinflammatory, antibacterial, antimicrobial, antifungal, antioxidant and anticancer properties. The study of [12] showed the capability of the plant for being immuno-stimulant as well as antioxidant.

Table 1. Medicinal and local uses of (Henna).

Medicinal Uses	Local Uses
1) Skin diseases.	1) Skin dye.
2) Fever.	2) Hair dye.
3) Smallpox.	3) Leather dye.
4) Headache.	4) Wool dye.
5) Burns.	5) Textile industry.
6) Leprosy.	
7) Leishmania.	
8) Dysentery.	

Table 2. IC_{50} values of major metabolites in active *Lawsonia inermis* L. subfractions.

Compound (subfraction)	IC_{50} value (μg/mL)
Lalioside (SF 5)	5.02
Luteolin-4'-*O*-β-D-glucopyranoside (SF 7)	10.27
Apigenin-4'-*O*-β-D-glucopyranoside (SF 7)	9.51
Luteolin (SF 10)	4.15
Apigenin (SF 13)	8.30
Amphotericin B (Positive control)	1.17



Graph 1. HPLC chromatogram of *Lawsonia inermis* L. leaves extract at 280 nm Acquired in the HPLC-HRMS-SPE-NMR mode.

Ethanol extract of leaves of *Lawsonia inermis* L. **Figure 5** showed significant antifungal against phytopathogenic fungi. Ethanol extract can be used as alternative source of antifungal agents for protection of plants or crops against fungal infection [14] & [19].

9. Conclusion and Recommendations

Depending on the wide range of habitats, the identified plant is vital for various ecosystems and plays a central role in maintaining the balance of regions environmentally; it also helps in protection of watershed, stabilization of the slopes, and improvement of soil and moderation of the climate.

Successful conversation about biodiversity requires involvement of all stakeholders from the smallest local communities to the global community. Therefore, we recommended the following:

- Comprehensive pharmacological studies on the whole plant (**Figure 6**) of *Lawsonia inermis* L. are required because it is considered as a valuable source of unique natural products for development of medicine against various diseases.
- Immediate intervention is required to protect not only *Lawsonia inermis* L. but all the entire flora of the area to attain sustainability.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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