A Review on Indian Madder as an Useful Herb

Dudhe A.R.,1* Choudhari N.,1 Dudhe R.,2 Katole G.,1 Mahajan R.,1 Pathak N.,1 Darode A.,1 Devnani D.3

1Nagpur college of Pharmacy, Hingna Rd, Wanadongri, Nagpur, Maharashtra, 441110, India
2Adarsh Institute of Pharmacy, Nandanvan, Nagpur, Maharashtra, 440024, India
3School of Pharmacy, G H Raisoni University, Saikheda, Chhindwara, M.P. 480337, India

Email: anshududhe@gmail.com

Received 01 May 2023, Accepted for publication 24 May 2023, Published 30 June 2023

ABSTRACT

India is also known as "the botanical garden of the world". There are many plants in India that are used for the treatment of various diseases. Nowadays, people prefer herbal products to synthetic ones because they have fewer side effects and therapeutic activities. The phytochemicals in Indian madder have many therapeutic activities. Indian madder is called manjishtha and is found in hilly areas near streams and rivers. In these, we will study the various medicinal uses of Indian madder, like anti-inflammatory, antimicrobial, anti-ageing, anti-acne, anti-diabetic, anti-mutagenic, etc.

Keywords: Indian Madder, Therapeutic Activity, Anti-Acne, Manjishtha.

INTRODUCTION

In India, people have used herbs as medicine since ancient times. There are 50,000 plants in India that have medicinal properties with few side effects. The history say that the products of herbal medicine safe and more effective. In present era 80% of the world’s population believe in the herbal medicine for the primary healthcare system, especially in developing countries. One of the important medicinal plants is Manjishtha, commonly known as Indian madder, which is found in hilly areas near streams and rivers.[1] The Indian madder is scientifically known as Rubia cordifolia Lin. Manjishtha is a climber found in the north-west Himalayas, the Nilgiris, and other hilly areas.[2–3] Manjishtha plays an important role in Ayurveda, which is the oldest form of the healthcare system. It removes toxic and harmful substances from the body (Fig. 1). The world-famous Chinese pharmacy book also recorded this herb, Divine Farmer’s Materia Medica also has a history of 2000 years about herbal plants.[2] Manjishtha used as a blood cleaner and is mainly used to treat urinary, blood and skin related disease. The plant root part of Manjishtha has also used for laxatives, painkillers, paralysis, rheumatism, dropsy, and intestinal ulcers. The dried stem is used in blood disorder, skin disease, urino-genital complaints, pile ulcer swellings, etc. It is mostly found in loamy soil that is rich in humus.[4] It is used in the treatment of Alzheimer's, diabetes, cancer, and allergies.[5] In the modern Pharmacopoeia, Manjishtha is found to be active against cancer cell lines such as lung melanoma, lung carcinoma, and sarcoma.[6] Indian madder's macroscopic characteristics: It have brown to purple color pigments, stems are cylindrical, thin, and wiry in shape, they are little bitter in flavor.[7] These plants' roots are used both orally and externally to enhance the luster and glow of the skin and help with the removal of acne, freckles, and discoloration, making them useful in the beauty industry (Fig. 2-3).[7] The imbalances of the pitta dosha in ayurveda can be successfully treated with manjishtha.[8]
Vernacular Name[6]

<table>
<thead>
<tr>
<th>Languages</th>
<th>Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin</td>
<td>Rubia Cordifolia</td>
</tr>
<tr>
<td>English</td>
<td>Indian Madder</td>
</tr>
<tr>
<td>Hindi</td>
<td>Manjit</td>
</tr>
<tr>
<td>Marathi</td>
<td>Manjestha</td>
</tr>
<tr>
<td>Bengali</td>
<td>Manjith</td>
</tr>
<tr>
<td>Tamil</td>
<td>Shevelli</td>
</tr>
</tbody>
</table>

Cultivation of Indian Madder
The plant can be multiplied via two nodal cuttings. Seed propagation is used to cultivate these plants on a large scale. These plants are climbers, so they require a lot of moisture and a place to thrive.[9] The majority of it is grown in Darjeeling, India. The seed propagation method is used to produce this plant on a huge scale. Light shade is used to grow the plant.[10] It is primarily found in Asian nations like Malaysia, Afghanistan, China, and India.[2]

Table-1: Scientific Classification of Indian Madder[8-10].

<table>
<thead>
<tr>
<th>Plantae</th>
<th>Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicotyledoneae</td>
<td>Class</td>
</tr>
<tr>
<td>Sympetalae</td>
<td>Subclass</td>
</tr>
<tr>
<td>Rubiales</td>
<td>Order</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>Family</td>
</tr>
<tr>
<td>Rubia</td>
<td>Genus</td>
</tr>
<tr>
<td>Cordifolia</td>
<td>Species</td>
</tr>
</tbody>
</table>

Chemical Constituents of Indian Madder
Anthraquinone glycosides and quinine are the major components of Rubia cordifolia. The glycosides of anthraquinone include 1, 1-hydroxy-2-methoxy anthraquinone and 1, 4-dihydroxy-2-methyl-5-methoxy anthraquinone, 1, 3-dimethoxy-2-carboxy anthraquinone.[11] These phytochemicals have anti-inflammatory, bronchodilator, pain-relieving, and anti-microbial activities, among others.[12-13] They are used in cosmetic goods to cure a variety of illnesses, including jaundice, liver infections, acne, and other skin disorders. They also have anti-dysentric, antihelminthic, galactopurifier, and rejuvenating effects.[14] Alkaloids, amino acids, glycosides, saponin, and tanins are some of the phytochemicals found in Manjishtha.[4] Manjishtha also contains glycosides such as rubiadin, rubiprasin, alizarin, garancin, mollugin, and furomollugin, as well as phytochemicals such as purpurin, munjistin, xanthopurpurin, and pseudopurpurin (Fig. 4).[15-16]
Biomarkers of Indian Madder Responsible for Therapeutic Activities:[17]

1. Hepato-protective and antioxidant Rubiadin
2. Anti-genotoxic Alizarin
3. Mollugin is an anti-platelet drug.
4. Effective COX-2 inhibitors, alizarin, mollugin, and lucidin
5. Antitumor RA-700, RX-XI, XII, XII, and XIV30
6. 1-hydroxytectoquinine, a pain reliever

Pharmacological Actions of Indian Madder

1. **Anti-acne activity:** Propionibacterium acnes is the pathogen responsible for the pathogenesis of acne. Indian madder has a chemical constituent that helps suppress inflammatory mediators like pro-inflammatory and cytokines reactive oxygen species (ROS), which are responsible for the formation of acne.[18]

2. **Hepato-protective activity:** Rubiadin acts against the carbon tetrachloride (CCl₄) which responsible for hepatic damage in rats.[15] Treating the rat with plant extract (aqueous methanol extract of Rubia cordifolia) reduced the death rate to 30 %.[19] They prevent kidney stone in human beings. It is found that it work against acetaminophen which leads to hepatic damage.[20]

3. **Anti-viral activity:** The roots of rubia cordifolia have compounds like furomollugin and mollugin strongly prevent the secretion of hepatitis B surface antigen (HBsAg).[21]

4. **Cardio protective activity:** Indian madder act as antioxidant, diuretic, blood purifier and calcium channel blockers. They play major role in management of congestive heart failure (CHF) and hypertension.[22]

5. **Anti-stress activity:** The alcoholic extract of the rubia cordifolia controls the level of produced stress by enhancing the brain GABA concentration as well as decrease the corticosterone and dopamine level.[23]

6. **Anti-platelets activity:** It prevent the platelet aggregation produce by PAF (platelets activating factor).[19] It also prevents the binding of 3H-PAF.[20]

7. **Anti-hyperglycemic activity:** According to the studies it has found that alcoholic extract of Rubia cordifolia plant have the anti-hyperglycemic effect in rats.[22] The alcoholic extract of the plant found to be more effective than the standard drug (Metformin), because of their antioxidant property.[24]

8. **Wound Healing activity:** In Ayurveda there are many plant drugs which are used for wound healing, and one of them is manjishtha.[23] It encourages the excision wound to contract and become epithelial.[25-26]

9. **Anti-allergic activity:** Rubia cordifolia alcohol extract prevented mouse and rats passive cutaneous anaphylaxis (PCA).[27-28]
10. **Anti-Cancer activity:** An *in-vitro* bioassay using an animal model was used to demonstrate the anti-cancer activities of manjishtha extracts, and have growth inhibitory activity of cancer cells.\[29]\n
11. **Anticonvulsant activity:** An isolated triterpene from the petroleum ether extract of manjishtha that is acetone soluble was found to exhibit anticonvulsant properties.\[30]\nIt inhibits seizures induced by MES (Maximum electric shock).

12. **Anti-bacterial activity:** When *Rubia cordifolia* was investigated in a lab, antibacterial activity was discovered.\[31]\nIt has strong efficacy against *P. aeruginosa*, *S.aureus*, and *B. subtilis* (Table 2-3 and Fig. 5-7).

**Table-2: Effect of Indian Madder on Different Systems of Body**\[32]\n
<table>
<thead>
<tr>
<th>Systems</th>
<th>Effect of Indian Madder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestive system</td>
<td>Prevent indigestion.</td>
</tr>
<tr>
<td>Circulatory system</td>
<td>Blood purifier.</td>
</tr>
<tr>
<td>Respiratory system</td>
<td>Removing excess of mucous.</td>
</tr>
<tr>
<td>Reproductive system</td>
<td>Increased uterine contraction and produces menstrual flow.</td>
</tr>
<tr>
<td>Urinary system</td>
<td>Prevent kidney stone.</td>
</tr>
<tr>
<td>External action on skin</td>
<td>Relieves form skin disease like pimple and give anti-inflammatory and acne.</td>
</tr>
</tbody>
</table>

**Table-3: Pharmacological Activities of parts of Indian Madder plant**\[33-34]\n
<table>
<thead>
<tr>
<th>Activity</th>
<th>Extracted from Which Part of Plant</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti acne</td>
<td>Root / stem</td>
<td>Decrease the pro-inflammatory cytokines and reactive oxygen species (ROS).</td>
</tr>
<tr>
<td>Hepato-protective</td>
<td>Bark</td>
<td>Works against the carbon tetrachloride (CCL4) that causes rat liver damage.</td>
</tr>
<tr>
<td>Wound healing</td>
<td>Root</td>
<td>It promotes the excision wound's contraction and epithelialization.</td>
</tr>
</tbody>
</table>
CONCLUSION

Due to improved safety and efficacy with no or few adverse effects, clinical research on herbal formulations and their commercial medicines is in high demand. This review demonstrates the main chemical components, the pharmacological effects supporting the statements made about this plant in traditional systems of treatment, and its therapeutic uses. The manjishtha plant, used in folk medicine and Ayurveda, contains a variety of phytochemicals that have medicinal potential. These phytochemicals include those that are antimicrobial, hepatoprotective, cardioprotective, and neuroprotective.

REFERENCES


