



# MANJISTHA (RUBIA CORDIFOLIA):-A COMPREHENSIVE REVIEW ON ITS PHYTOCHEMICAL COMPOSITION AND MEDICINAL PLANT ACTIVITIES

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## ABSTRACT:

Ayurveda is a centuries-old Indian medical tradition. Since the early age, human life has a great impact on an individual's physical appearance. Skin is the basic element of the external appearance. Beauty is generally depended on the type and texture of the skin. Manjistha also exhibits anti-carcinogenic, anti-inflammatory properties. Its anthraquinones, glycosides, saponins, phenols, flavonoids, and alkaloids, tannins are phytochemical constituents. Acne is among the most common skin disorders that impact nearly all adolescents. Being a long-lasting condition with repeated flare-ups and remissions it is frequently linked with negative mental effects, lowered confidence and social isolation. The modern medical approaches for acne management. Manjistha has the potential to serve as an excellent natural remedy for treating acne.

## KEYWORDS :

Manjistha , Cosmetics , Skincare , Acne , Beauty , Phytochemicals

## INTRODUCTION :

A species of flowering plant known as *Rubia cordifolia* Linn, also known as Indian madder or common madder, is a perennial. Herbaceous climber, prickly or scarious herb plant with red rhizomatous base and root it is an important herbal drug used in Indian medical practice. The root of the plant is commonly known as manjishta and sold in the market under the commercial identify manjishta. [1]

The stems and roots are well known as source of anthraquinones, the roots have also been reported anti-oxidant anti-inflammatory anti-cancer, immunomodulator, hepatoprotective and are extensively used against blood, urinary and skin diseases. In ancient world, Manjistha is reputed as an efficient blood purifier and hence is extensively used against infections of the skin, blood, and urine. Manjistha was externally applied to major burns and mixed with honey on freckles and blemishes. It remained an effective treatment for stubborn skin conditions like leucoderma, and oedema also used as febrifuge and against blood disorders in Ayurveda. It has been used traditionally in many polyherbal formulations for various ailments and cosmetic preparations because of its inflammatory, antiseptic and its activity as a galacto-purifier. [2] The root is used both externally and internally to improve skin's lustre and glow, and aids to remove pimples, freckles and discoloration. Traditionally the roots are Problems with skin pigmentation and irregularities, as well as a great tool for improving complexion. [3]

The Indian Madder of commerce consists of short rootstocks with a lot of roots that are smooth, straight, and cylindrical, about the same size as a quill a thin, brownish covering is applied to these cork, which separates in flakes to reveal a reddish-brown bark marked by longitudinal furrows. [5] The following is a sweet root. by a

sour and bitter flavor. Madder has been used in many Asian countries as a dye for red, scarlet, and other shades cotton and woolen fabrics in shades of brown and mauve. [6]both in India and neighbors, madder has a long history in skin as well. treatment and care, and it has been utilized internally in disorders of the urinary tract.[7]

The majority of the Ingredients in all systems of medicine especially Traditional systems like Ayurveda, Siddha, Chinese, Unani, Folk, etc. These systems Take medicinal plants. for example. Backbone. More than half of the world population i.e. around 3.3 billion,relies Upon medicinal plants for maintaining Health. They frequently make use of plants. For food, shelter and for the requirement of Other basic needs. [17] These vegetations are considered as ecological health marker. The drugs that were made from medicinal Herbal medicines or plants are phytomedicines . [19]

### □ Vedic review of manjishta

#### [1] ATHARVAVEDA :-

In Atharvaveda does not mention manjishta directly, but in the 19<sup>th</sup> kaand, it talks about a herb called jangid. Interestingly,this plant seems very similar to manjishta in both where it grows and how it heals. Since manjishta is also known by the name jingini, it,s quite possible that the jangid mentioned in the veda actually refers to the same plant. The text says that jangid helps remove several illnesses, such as Ashareek, Vishareek, balas, and Takma, showing it,s strong healing power.[15]

#### [2] MATASYAPURANA :-

Manjishtha is mentioned several times throughout the matasyapurana. In 118 chapters in verse 23 along with ashmantak, jambeer trees manjishtha is described by its synonym Kala. Manjishtha is also referred to in verse 63 of 217 chapters as Kala. And in verse 72, 77 it is defined by its synonym samanga. Along with laaksha, priyangu and other drugs manjishtha is defined in chapter 218 verse 6.[16]

- Taxonomical classification [18,22]
- Kingdom : plantae
- Subkingdom : Tracheobionta
- Superdivision : Spermatophyta
- Division : Magnoliophyte
- Class : Magnoliopsida
- Subclass : Rubiidae
- Order : Gentianales
- Family : Rubiaceae
- Genus : Rubia
- Species : Rubia Cordifolia L
- Vernacular Names [18,22]
- English : Indian Madder
- Sanskrit : Aruna, Bhandi
- Hindi : Manjit, Manjishta
- Urdu : Majith
- Malayalum : Manjithi
- Marathi : Manjestha
- Kashmiri : Dandu
- Assamese : Majathi, Mandar

- Punjabi : Kattha, Majitha
- Gujrati : Majitha
- Manipur : Moyum
- Nepali : Majito

#### □ Botanical description (Morphology) [20]

- Type : perennial, climbing, branched herb.
- stem : Thin, quadrangular, rough, with small prickles that help it climb.
- Leaves : Simple, opposites or in whorls of 4-6 ovate/oblong rough on both surface with a pointed tip.
- Flowers : Small, greenish-white to yellowish, borne in cymose Panicles.
- Fruits : A small globose berry, purplish-black when ripe.
- Roots : Long, cylindrical, red-coloured inside, used as the main medicinal plant



**Rubia cordifolia plant**

#### □ Ayurvedic properties [19]

- Rasa : Tikta, (bitter), Kashaya (astringent), sweet, (Madhur)
- Guna : Guru (heavy) Ruksha (dry)
- Veerya : ushna (hot)
- Vipaka : katu ( pungent)
- Dosha : pacifies kapha and pitta
- Karma : varnaropana, jwarhara, shothahar, kushthaghna

#### • **PHYTOCHEMICAL CONSTITUENTS :**

##### [I] Anthraquinones

The roots and stem is source of anthraquinones, purpurin and naphthoquinones. Anthraquinones are the main class of bioactive compounds present in *Rubia cordifolia*, comprising alizarin, munjistin, rubiadin, purpurin, xanthopurpurin, and techoquinone. So far, about 28 different anthraquinones have been isolated from *R. cordifolia*. Dosseh and colleagues identified four novel anthraquinones from its roots, namely 1-hydroxy-2-methoxy anthraquinone, 1,4-dihydroxy-2-methyl-5-methoxy anthraquinone (or 1,4-dihydroxy-2-methyl-8-2-carboxymethoxy anthraquinone), 1,3-dimethoxy rubiadin, and anthraquinone. Anthraquinone also called anthracenedione or dioxoanthracene, is an aromatic organic compound that represents the most common class of naturally occurring quinones. [27] Generally, the term “anthraquinone” specifically denotes a particular isomer of this compound. Anthraquinone are extensively

utilized as colorants in the food, pharmaceutical, and cosmetic industries. [28] They have also been reported to exhibit significant biological activities, including Anthraquinone also called anthracenedione or dioxoanthracene, is an aromatic organic compound that represents the most common class of naturally occurring quinones. Generally, the term "anthraquinone" specifically denotes a particular isomer of this compound. Anthraquinone are extensively utilized as colorants in the food, pharmaceutical, and cosmetic industries. They have also been reported to exhibit significant biological activities, including antibacterial, anti-inflammatory, antioxidant, antifungal enzyme inhibition bone labeling, and anticancer properties antibacterial, anti-inflammatory, antioxidant, antifungal, enzyme inhibition, bone labeling, and anticancer properties. [29]

### [II] Purpurin

Purpurin is a red anthraquinone derivative commonly presents in the roots of madder (*Rubia tinctorum*), Asian madder (*Rubia akane*), manjishta (*Rubia cordifolia*) and Bengal madder (*Rubia radix*). It has long been used as a natural colorant in art and continues to find applications today. The compound was first chemically isolated by Pierre and Colin in 1826, and later, in 1868, Grabe and Lieberman identified it as a derivative of anthracene. Purpurin has the molecular formula  $C_{14}H_8O_5$  and a molecular weight of 256 g/mol. It appears as orange, needle-like crystalline solids, is soluble in chloroform but insoluble in hexane, and can be precipitated by adding acid to a boiling aluminium sulfate solution. [36] The crystals have a melting point of  $259^\circ C$ . In plants, the biosynthesis of anthraquinones via the shikimic acid pathway requires the participation of multiple metabolic routes, such as the tricarboxylic acid (TCA), mevalonate (MVA) and methylerythritol phosphate (MEP) pathway. [37] The formation of DHNA takes place through a chain of successive enzymatic reactions within the shikimate pathway. At the initial stage, phosphoenolpyruvate (PEP) and erythrose-4-phosphate (E4P) serve as substrates for the aldol condensation reaction catalyzed by 3-deoxy-7-phosphoheptulon synthase (DAHPS), which produces 3-deoxy-D-arabino-heptulosonate-7-phosphate (DHAP) following this, DAHP is dephosphorylated and cyclized through the action of 3-dehydroquinate synthase (DHQS), leading to the generation of 3-dehydroquinate (DHQ), a key rate-limiting intermediate in the tricarboxylic acid (TCA) cycle. [38]

### [III] Bicyclic hexapeptides

Bicyclic hexapeptides are widely regarded as the primary bioactive constituents of *R. cordifolia*, where 19 bicyclic peptides have been identified in *R. cordifolia*. Numerous rubiaakane series peptides which are anti-tumor bicyclic hexapeptides, have been isolated from this plant. Several cyclic hexapeptides have also been discovered and extracted from *R. cordifolia*. Each *Rubia akane* compound features two ring systems. One with 18 members and another with 14 members composed of amino acids like N-methyl-O-methyl-L-tyrosine, pyroglutamic acid, L-alanine, and Dalanine. [27]

### [IV] Naphthoquinones

Naphthoquinone represents collection group of secondary metabolites naturally produced by bacteria, fungi, and higher plants. These compounds exhibit a wide variety of biological and pharmacological activities. They also play a crucial role in vitamin K biosynthesis and in electron transport processes. Due to their characteristic brown or yellow pigmentation, naphthoquinone ring-containing structures have traditionally been utilized as colorants in textiles, cosmetics, and food products. Naphthoquinone ring containing moiety is structure presents in many trees and plants. Approximately 1200 naturally occurring compounds are classified as quinones, all of which possess a quinoid structural framework. The presence of substituent groups, either within the quinone ring itself or on adjacent rings, significantly influences the chemical behavior and reactivity of quinones. [27]

Naturally occurring naphthoquinones serve an important ecological function through negative allelopathy, which involves the suppression of nearby organisms by releasing substances that inhibit their germination or growth, the allelopathic activity of naphthoquinones was first documented by Davis in 1928, who discovered that juglone (5-hydroxy-1,4-naphthoquinone) was the compound responsible for hindering the growth of plant species surrounding *Juglans nigra*. [30]

## PHARMACOLOGICAL ACTIVITIES :

### 1)Anti-Acne property

The methanol extract of *Rubia cordifolia* inhibit proliferation of *Propionibacterium acne*. [41] It effective against TNF alpha and show low activity against IL-8. The plant is considered astringent and useful in external inflammation like ulcers and skin diseases. [42] The anti-acne activity against *Propionibacterium acne*, *epidermidis*, *malassezia* compared with standard clindamycin gel. [43] The polymorphonuclear leukocytes (PMNL) and monocytes were treated with culture supernatant of *Propionibacterium acne* in the presence or absence of herb.

### 2)Anti-oxidant activity

The root of *R. cordifolia* is rich in the antioxidant rubiadin, a dihydroxyanthraquinone compound that effectively inhibit lipid peroxidation caused by  $\text{FeSO}_4$  and *T*butylhydroperoxide (*t*-BHP) in a dose dependent manner. It also comprises other antioxidant such as alizarin and rubiadin, which contribute to the prevention of peroxidation. The antioxidants found in this herb and inhibit  $\text{FeSO}_4$  induced lipid peroxidation and glutathione depletion. This antioxidant property is due to direct interaction with iron, Rubiadin, extracted from the alcoholic fraction of *R. cordifolia*, exhibits strong antioxidants activity and protecting against  $\text{FeSO}_4$  and *t*-BHP induced lipid peroxidation. And inhibit effect of  $\text{Fe}^{2+}$  induced lipid peroxidation. The antioxidant property of this preparation was better than EDTA, tris mannitol, vitamin E, and *p*-benzoquinone. *Rubia cordifolia* rich in flavonoids, manjishta combats oxidative stress, protecting cells from damage. [48]

### 3)Anti-inflammatory activity

*Rubia cordifolia* has traditionally been utilized as an analgesic, astringent, external application in inflammations, diseases of the skin and ulcers. [44] It is also claimed that the plant relieve the symptoms of pruritus, burning and exudation from skin. The topical medication was tested in studies on eczema patients. When the plant was used, the showed a 50% decrease in severity score within 4 days, the oedema, exudation and *Rubia cordifolia* was significantly relieved of its itching. [45] tested for its anti-inflammatory properties in rats paw oedema caused by carrageenan The plant showed a lot of anti-inflammatory activity at doses of 10 and 20 milliliters per kilogram of the water emulsion. [46] The undertaking was comparable to phenylbutazone (100 mg/kg). *Rubia cordifolia* root extract has been used as anti-inflammatory agent because of the presence of rubimallin. [47]

### 4)Wound healing activity

The root of extract of *R. cordifolia* has demonstrated strong wound healing potential. When *Rubia cordifolia* and several other herbal preparations were evaluated for their wound recovery property, they were found to facilitate wound contraction and promote epithelization. Both the ethanolic extract and hydro gel formulation of the roots exhibited significant effectiveness in enhancing functional recovery and tissue repair, accompanied by not able histopathological improvements. [49]

### 5)Anti-microbial activity

The plant exhibits string antimicrobial activity. Especially against *staphylococcus* and *Escherichia coli*. This property makes it highly beneficial in the management of skin ailments, wound infections, and other microbial conditions. The root extracts of *R. cordifolia* have been studied for antimicrobial activity against gram +ve bacteria. *Rubia cordifolia* is used as a dye from natural sources a study was taken up to test some natural dyes have antimicrobial activity with a view to develop protective clothing from these. The chloroform and the methanol extracts reported to have antibacterial activity on gram positive strains although gram negative *pseudomonas aeruginosa* was also inhibited by the methanol extracts in a dose dependent manner. [50]

## Traditional uses

- *Rubia cordifolia* inhibits acne- causing bacteria, skin brightening and treating skin disorder, improves skin tone and brightness the complexion. It helps reduces hyperpigmentation. Used internally and externally on skin for promoting skin whitening.
- In traditional Korean system of medicine the root is used to treat rheumatism, jaundice and menstrual disorders,
- The stem is used in tibetan system of medicine in the treatment of blood disorders and spreading fever of kidneys and intestine
- Unani system of medicine :- *R. cordifolia* has been prescribed for paralysis, dropsy, jaundice, urinary tract obstructions

## CONCLUSION :

Manjishta is very important plant, which is described from ancient time. Acharya had already known the importance of manjishta in therapeutic management. Ayurveda is an ancient medicinal science in which using herbs and other natural ingredients. Ayurveda product and indian herbs are being sourced and tested for use in the cosmetics industry and practiced in beauty parlors. Manjishta is colouring agent and promotes pigmentation of skin.

It is extensively used for treating a variety of skin conditions, enhancing lymphatic functions, managing cough and cold, preventing viral infections, promoting digestion, treating respiratory diseases.

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