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Majeeth (*Rubia cordifolia* linn): A review

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ABSTRACT

Rubia cordifolia Linn also called as common Madder or Indian Madder, is a species of flowering plant. *Rubia cordifolia* is a branched climber with small, greenish white flowers that are arranged in a cluster of round, fleshy, purple fruits. Its roots have a brownish red bark from which a red dye is obtained. This plant grows well in hilly areas, and the root has medicinal values. It is an important member of the Rubiaceae family. Dried roots of *Rubia cordifolia*, is a rich source of anthraquinones responsible for its traditional, phytochemical and pharmacological activities. Today clinical investigations of herbal formulations and their market preparations, both are on demanding because of better safety and efficacy without or minimal side effects. Many studies suggested that *Rubia cordifolia* has many biological effects such as antioxidant, anticancer, anti-inflammatory and analgesic, hepato-protective, anti-acne, blood purifier activity, astringent, antimicrobial, anti-dysentric, antiseptic, nephron-protective properties. The present article describes a detailed review of literature for this plant species including taxonomy pharmacology and photochemistry in an organized way. This review paper will surely serve as an important source for the future scientific investigations on this plant.

Keywords: *Rubia Cordifolia*, Anti-Inflammatory, Antidiabetic, Majeeth, Hepato-Protective, Pharmacology

1. INTRODUCTION

Rubia cordifolia Linn also called as common Madder or Indian Madder, is a species of flowering plant^{1,2,3,4}. It is a perennial, herbaceous climber, prickly or scarious herb plant with red rhizomatous base and root^{3,4,5,6,7}. It is an important herbal drug used in Indian system of medicine. The root of the plant is commonly known as Manjistha and sold in the market under the commercial name Manjith⁸. The first recorded use of this herb as drug was mentioned in world famous pharmacybook of China, Divine Famer's Materia Medica, which has history of 2000 years, It is described as a detoxifying herb. It removes the toxins from the blood which are called as "ama" in Ayurveda^{3,8}. As *Rubia* stands for colour red. It has been cultivated for red pigment derived from root^{3,4,9}. The drug Majeeth consist of dried stem of *Rubia cordifolia* Linn. family Rubiaceae up to 10 m long, found throughout the country ascending to 3750m⁵. The phytochemical constituents present in *Rubia cordifolia* includes iridoids, saponins, anthraquinones, tannins, alizarin quinones,⁴ It comprises about 450 genera and 6500 species and includes trees, shrubs and infrequently herbs^{4,6}. Many studies suggested that R.C has wound healing, antibacterial, antioxidant, anticancer, anti-inflammatory and analgesic hepatoprotective, anti-acne properties¹. Literature describes the beneficial effects of *Rubia cordifolia* in treatment of number of ailments including diabetes, cancer, acne, inflammation, allergy, enterocolitis, bacterial and viral infection. Other reported activities are immune-modulator, analgesic, diuretic, gastro-protective, hepato-protective and nephron-protective. *Rubia cordifolia* show potent antioxidant activity against lead nitrate and radiation induced toxicity. *Rubia cordifolia* has been evaluated for its wound healing activity. The leaves of this plant also studied for its antiviral and in-vitro free radical scavenging activity. Apart from its medicinal value, Manjistha has also been used as natural food colorants and natural dyes. The colouring pigments present in the roots are purpurin and munjistin in major amounts.^{10,11,12,13,14,15}

2. TAXONOMY

Fovvah fuh is the root of plant which is reddish in colour.^{12,14} It is use for purpose of dying^{1,4}. There are two varieties: *Jungli* and *Bustani*¹². This is small & rough plant having long thin & red root; branch long quadrangular, rough often only one, leaves are round. The fruits are round, green at first, red later, black when ripe¹². stem is more or less cylindrical flattened, wiry, brown to purple colored; mature stem shows exfoliating cork ruptured at places, forming dome-shaped structure¹ throughout India in hilly

area up to 3700m^{10,13} Asian countries like India, China Japan Afghanistan, Vietnam and Malaysia³ cultivated in Ceylon, Malay Peninsula, Java Japan, Tropical Africa.⁵ North-west Himalayas, Nilgiris and other hilly districts of India.⁶

Table 1: Taxonomic Details of *Majeeth*

Kingdom	Plantae
Class:	Dicotyledoneae
Subclass:	Sympetalae
Order:	Rubiales
Family:	Rubiaceae
Genus:	Rubia
Species:	Cordifolia ^{1,3,4}

SYNONYMS: Rubia mujesta Roxb^{10,11}

Vernacular names: *Majeeth* is known by a number of vernacular

Table II. Vernacular names of *Rubia cordifolia*

Arabic:	fovvah ^{5,11} Foh-us-Sabagh ^{9,14} uruqul-sabagh ^{4,14} fovvahus-
Persian:	sabba-ghin ^{11,12} Runas ^{5,11,12} Romnas ^{5,11}
Urdu:	Majitha ^{5,11} Majeeth ^{5,11} manjith ⁴
Hindi:	Majith ⁴ Mamjit ^{5,11} Manjit ^{3,5} malo ¹¹ manjistha ³
Ayurvedic:	Manjishthaa, Vikasaa, samangaa, Aruna, Gandira ¹⁰
Tamil:	Manjatte ,Manjiti, shevelli ¹¹ Mancitti ^{3,11}
Kannada:	Manjustha,Chitravali ¹¹ Siragatthi,Bhandeera ³
Malyalam:	Manjatti ^{4,11} Poont ⁴
Sanskrit:	Manjistha, Aruna Bhandi, Bhadiralatik ^{5,11}
Telugu:	Manjitha, Ciranji, Tamravalli, Manjistatiga ^{5,11}
Gujarati:	Majitha ^{3, 5}
Punjabi:	Manistha,Manjit ⁵
English:	Indian madder, ^{13,16,17,18} Bengal Madder ⁵ . Dayer's madder ¹⁷
Bengali:	Majith,Manjistha, ⁸ Manjit ¹⁷
Unani	Manjeeth ⁵ Duzralūs ¹²
Kashmiri:	Dandlu ⁴ . Dandu ⁵

3. BOTANICAL DESCRIPTION

Rubia cordifolia is a perennial climbing herbaceous plant; growing up to 10- 12m.^{2,5,9}

Root: roots very long, cylindrical flexuous, with thin red bark. It is brittle, hardsplintery in texture. External bark gets easily break^{5,17}Roots long cylindrical, and rusty brown in color^{8,19} roots very long cylindrical flexuous within red bark ; stems often many yards long, roughly grooved, becoming slightly woody at the base; bark white⁵

Stems: stems often many yards long, rough, grooved, becoming slightly woody at base white.^{17,19}

Fruits: Ripen fruit is didymous or globose, 1-2 seeded, smooth, shining, and purplish-black succulent red juice.^{5,7,8,19}

Flowers: Flowers are cymes, fragrant, minute, whitish or greenish, yellow^{4,8} flower in terminal panicle dglabrous cymes; branches trichomatous^{5,20}

Leaves: ovate, acute lanceolate, 5-7 nerved, 2-10 cm long, and 2-5cm broad, occurring in whorls of 4. Leaf base is slightly cordate^{4, 8, 19, 20} Lower leaves larger than the upper, all scabrous above, on the nerves beneath margin with white prickles, base rounded or slightly cordate⁵.

Taste: Sweet bitter, acrid^{4,5,21,22,23}

Phytochemical constituents

Active components were isolated from various parts of *Rubia cordifolia* in roots containing several compounds like resinous & extractive matter, coloring matter, salt of lime red crystalline principle –purpuric yellow principle. Quinones like quinine mangistin^{5,13} alizarin, mollugin, antraquinone^{3,4} anthraquinone & their glycosides⁶ Bicyclic hexapeptides⁷ Saponins and some naphthalene derivatives are isolated²⁰Purpurin³ Bicyclic hexapeptides, Iridoids, carboxylic acids & saccharides were isolated from various parts of *R. cordifolia*.²⁰

4. PHARMACOLOGICAL STUDIES

Anti-inflammatory activity

Rubimallin from the root of *R. cordifolia* used as an anti-inflammatory agent.³ Extract of *Rubia cordifolia* contains effective anti-inflammatory constituents therein to produce anti-inflammatory activity by inhibiting nitric oxide produced in vitro from sodium nitroprusside, and in LPS-activated murine peritoneal macrophages, ex vivo.⁶ Moullugin is showed anti-inflammatory properties.³

Anti-microbial activity

Sitosterol and daucosterol possess antibacterial activity aldehyde acetate, dihydromollugin, rubimallin have significant antibacterial activity against Klebsiella, pneumonia.² It inhibit both gram-positive and gram-negative bacteria. In one study some antimicrobial agents, emodin and physicians were isolated as the most active constituents (Basu et al, 2005).⁷ The root extracts of *R. cordifolia* have been studied for their antimicrobial activity against various pathogenic bacteria. Sitosterol and daucosterol possess antibacterial activity. *Rubia cordifolia* a reported having considerable antimicrobial activity against gram +ve bacteria.²⁰

Nephroprotective:

The in-vivo study on rats having artificially induced urolithiasis by ethylene glycol showed that hydro-alcoholic root extract of *Rubia cordifolia* significantly inhibited the formation of urinary stones. The findings of another in-vivo study on swiss albino mice in which nephrotoxicity was induced artificially by cisplatin, revealed that hydroalcoholic root extract of *Rubia cordifolia* exhibits nephron-protective activity.³

Anti-diabetic Action:

Alcoholic extract of *Rubia cordifolia* has anti-diabetic properties and this activity was demonstrated by study conducted on alloxan treated rat model. The extract of roots reduced the blood sugar level.^{3,6,8} Administration of the alcoholic extract of roots of *R. cordifolia* showed significant hypoglycemic effect in alloxan-induced diabetic rats hyper triglyceridemia, enhanced transaminases of liver and kidney, hypochromic microcytic anaemia, and loss of body weight in streptozotocin -induced diabetic rat models. Serum cholesterol and triglyceride level were decreased whereas serum high density lipoprotein in diabetic rat.^{7,19}

Wound healing activity

The root extract of *R. cordifolia* was reported as an effective wound healing principle in experimental models as wound healer. Ethanolic extract and the hydrogel formulation of roots were found to be effective in the functional recovery and healing of wounds and also lead to histo-pathological alterations.²⁰

Anti hyperglycemic, anti-stress and nootropic activity

Effect of alcoholic extract of roots of *Rubia cordifolia* was studied on elevated blood glucose level in alloxan treated animals. The extract reduced the blood sugar level raised by alloxan. Alcoholic extract enhanced brain gamma-amino-n-butyric acid (GABA) levels and decreased brain dopamine and plasma corticosterone levels. Acidity and ulcers caused due to cold restraint stress were inhibited by alcoholic extract. It also antagonized scopolamine induced learning and memory impairment

Anti-platelet activating activity

Rubia cordifolia inhibits the platelet aggregation induced by platelet activating factor (PAF) but not thrombin.

Antiviral activity

Three naphthahydroquinones namely furomollugin, mollugin and rubilactone isolated from the root of *Rubia cordifolia* are reported to have antiviral activity.⁶

Anticancer activity

Anticancer activities of various fractions of *R. cordifolia* roots extracts was demonstrated through in vitro and or in bioassays based on animal models. The crude aqueous extracts demonstrated growth inhibitory activity on selected cancer cell lines.²⁰ The cyclic hexapeptides and quinones of *Rubia* exhibited a significant anticancer activity against various proliferating cells. The hexapeptides showed potent antitumour activity by binding to eukaryotic 80S ribosomes resulting in inhibition of aminoacyl -tRNA binding and peptidyl - tRNA translocation, thus leading to the stoppage of protein synthesis (Morita, 1992, Morita, 1993, Itokawa, 1993).⁷ Methanol fraction of *Rubia cordifolia* extract exhibited potent inhibition of Human cervical cancer cell line and Human larynx carcinoma cell line. *Rubia cordifolia* can be a source of potent pharmacophore for treatment of disease like cancer.¹

Diuretic activity

Hydroalcoholic root extract of *R. cordifolia* was evaluated for its diuretic property and got positive results. The hydroalcoholic extract as well as the ethanol extract showed significant increase in urine volume and electrolyte.²⁰

Gastro-protective activity:

Rubia cordifolia has both gastro-protective and ulcer healing properties. Triterpenoids present in root extracts are potent antiulcer and antioxidant compound which can be clinically explored.^{2,19,20}

Hepatoprotective activity

Quinone derivatives from *R. cordifolia* have hepato-protective effect.² The hepato-protective effects of rubiadin, were evaluated against carbon tetrachloride (CCl₄)- induced hepatic damage in rats. Rubiadin at a dose of 50, 100 and 200 mg/kg was administered orally once daily for 14 days. The substantially elevated serum enzymatic activities of serum glutamic oxaloacetic transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), serum alkaline phosphatase (SALP) and glutmyl transferase (-GT) due to carbon tetrachloride treatment were dose dependently restored towards normalization. The results of this study strongly indicate that rubiadin has a potent hepatoprotective action against carbon tetrachloride induced hepatic damage in rats. (Mohana et al.2006)⁷

Immuno-modulating activity

Flavonoids, tannins, cardiac glycosides, and phenols are present in *R. cordifolia* are responsible for enhanced immune modulation. Ethanolic extracts of whole plant administered to rats to test immunosuppressive activity and showed enhance cell mediated and humeral immune- potentiating activity.²⁰

Antioxidant property

Rubia cordifolia contains a wide variety of antioxidants like alizarin, hydroxyl anthraquinones and rubiadin. The study of in vivo antioxidant activity and its influence on ethanol induced immuno-suppression showed that the concurrent daily administration of madder prevented the decrease of humoral and cell-mediated immune response, phagocytosis index, leukocyte count, glutathione content etc., which were comparable with that of the combination of vitamin e and c.²⁰

Anti-acne property

The anti-acne activity of anthraquinone rich fraction of *R. cordifolia* in a gel formulation against propionibacterium acne, staphylococcus epidermidis, malassezia furfur is proved when compared with standard clindamycin gel.¹⁹ *R. cordifolia* found significant suppression of Reactive Oxygen Species from polymorphonuclear leukocytes (PMNL). Thus, *R. cordifolia* showed anti-inflammatory activity by suppressing the capacity of Propionibacterium acnes-induced ROS and pro-inflammatory cytokines.^{1,7}

5. ETHNOMEDICINAL USES

Traditionally, root are used internally in the treatment of abnormal uterine bleeding, stone in kidney bladder, dysentery⁸. Decoction of *majeeth* used in evacuation of lochia from uterus after delivery^{12,16,21} Due to its *jāli* property, it is used along with *sirka* in *dād*(ring worm) *bahak*(pityriasis)^{21,22,23}. It reduces inflammation of *tihal*^{12,23} and *jigger* by taking with *Sikanjabin*²². Syrup along with *ma'ul-asal* is useful in sciatica & paralysis²². It eliminates *fasad-i-zahar bulghum wa khoon*. Menstrual obstruction is removed from 12gram powder of *majeeth*²¹ 1gm tablet of madder root thrice daily useful in vascular and renal calculi. In tuberculous diarrhoeas *Rubia* had sedative effect on the intestine. Useful in cobra-bite and scorpion-sting. Fruits useful in hepatic obstruction¹⁷ Dried stem used in blood disorder, skin and urogenital disorder, ulcer inflammation¹⁰ *R. cordifolia* used in amenorrhoea, urinary tract obstructions menstrual disorder & blood detoxification^{4,7} *Hamūl*(Pessaries) along with honey is useful as *mudirr-i-hayd*(emmenagogue) & *mukhrij-i-janeen*(to expelled fetus)^{21,22,23} *Dimad*(paste) is beneficial for *falij*(paralysis), *amarz-i-bārīda*, *sa'fa*(alopecia), *hazāz* & *zarba wa saqata* (trauma)²³ Root leaves, seed are used in amenorrhoea, liver disease, gall bladder and spleen disease¹⁰ Fruit along with *sikanjbeen* useful in splenomegaly. It is used to improve the voice & complexion. 12 gm powder is beneficial in amenorrhoea. Paste locally apply over forehead for headache. 3.5 gm *Majeeth* & 7 gm *Revand chini* along with one cup of *Nbiḏh* is useful in fractures²¹

6. CONCLUSION

From above review, it is clear that *Majeeth* is a widely and traditionally used medicinal plant amongst all the thousands of medicinal herbs. Used internally or externally to cure and prevent various diseases. The multiple benefits of *Rubia cordifolia* made it a true miracle of nature. It has several effects like anti-oxidant, anti-inflammatory, anti-acne, anti-arthritis, anti-cancer, anti-convulsant, anti-diabetic, anti-microbial, anti-proliferative, anti-stress, anti-ulcer, anti-viral, potent blood purifier diuretic, gastroprotective, immune modulating hepatoprotective wound healing etc. Properties The pharmacological activities reported in the present review validate the great therapeutic value of *Rubia cordifolia*. It is an important source of chemical compounds such as anthraquinones, glycosides, saponins, steroids, phenols, flavonoids, alkaloids, tannins etc. Accordingly, *Majeeth* has a leading power for the development of new good efficacy drugs in future. That's why the industrialists should come ahead with innovative concepts and steps towards the most excellent use of this potential medicinal plant for the welfare of mankind

7. REFERENCES

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