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RUBIA CORDIFOLIA LINN: A TRADITIONAL HERB WITH VERSATILE PHARMACOLOGICAL POTENTIAL

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ABSTRACT

Herbs & its formulations have a long history of use in the treatment of human diseases and its extracts have long been regarded as a source of new and useful pharmaceuticals. According to Cragg's investigation, approximately 62% of commercially available drugs have natural product origins. *Rubia cordifolia* Linn**.** (family Rubiaceae), commonly known as '*Indian Madder'* or *Majeeth*, has been used for a long time in both the Indian and Chinese systems of medicine for treatment of various kinds of diseases. Its root contains a variety of chemical constituents which are medicinally important. Roots are traditionally used as anti-inflammatory, astringent, tonic, antiseptic, deobstruent, emmenogogue and blood purifier. For the last few decades or so, extensive research work has been done to prove its biological activities and the pharmacology of its extracts. The aim of this review is to create a database for further investigations of the discovered phytochemical and pharmacological properties of this plant to promote research. Thiswill help in confirmation of its traditional use along with its value-added utility, eventually leading to higher revenues from the plant.

KEYWORDS: Indian Madder, Majeeth, *Rubia cordifolia L*inn. & Rubiaceae.

INTRODUCTION

Rubia cordifolia often known as "*common madder*" or "*Indian madder*", is a species of flowering plant in the coffee family, Rubiaceae.[1] The family Rubiaceae comprises of about 450 genera with 6500 species and includes trees, shrubs and herbs.[2] *Rubia* denotes 'red' as their internal use imparts red color to breast milk and urine.[3] *Rubia* species being one of the earliest plant resources possessed important commercial & medicinal values. Commercially, they were used as natural dye stuffs in old days & improved commodity circulation; medically, these species being used as drugs were first recorded in the world famous pharmacy book of china, Divine *Materia Medica*, which has over 2000 year history.[1]

Botanical classification

Table 1: Botanical classification of *Rubia cordifolia* Linn.

Kingdom	Plantae
Class	Dicotyledoneae
Sub class	Sympetalae
Order	Rubiales
Family	Rubiaceae
Genus	Rubia
Species	*Cordifolia*[3]

Vernaculars

Table 2: Vernaculars of *Rubia cordifolia* Linn.

Arabic	*Fovvah*[4,5]
Urdu	*Majeeth*[5]
Persian	Ranus[4,5]
Kannad	Siragatti, Manjushta[5]
Ayurvedic	Manjisthaa, Vikasaa, Arunaa, Gandira, Raktaangi, Yojanavalli[6]
Unani	*Manjeeth* [6]
Hindi	Manjit, Majit[4]
English	Indian madder[4,5], Dyer's madder, Bengal madder[6]
Snaskirit	Aruna, Bhandi[4], Manjista, Kala-mashika[4,5]
Telgu	Chiranji[4,5], Manjishtatige, Tamravall[5]
Tamil/Siddha	Shevalli[4,5], Manjitti[4,5,6]

Description of plant

Majeeth is a root which is perennial, long, cylindrical & rusty brown in color.[7] Root is consist of a short stock, from which numerous cylindrical roots about the size of a quill diverge; these are covered by a thin brownish suber which peels off in flakes, disclosing a red-brown bark marked by longitudinal furrows.[8] The taste is sweetish at first, afterwards acrid and bitter.[7,8,9] According to "*Geelaani*" there is not a little sweetness in it. Fresh and red coloured is better.[7] There are two varities:[4,7,8] Wild variety and Garden variety. Garden variety is small in height & surface is rough with only one branch. Its leaves & fruits are round in shape. After ripening the fruit becomes black in color, it grows up in between the seeds. The fruits are filled with seeds.[7]

(a) **(b)**

Fig.1: (a) & (b): Whole plant of *R. cordifolia* Linn.

Part used: Dried root[5,7,9,10]

Temperament of drug (Mizāj): Hot 20 & dry 20[5,7,9]

Functions (*Af'al*)

Emmenogogue and diuretic (*Mudirr-i-bawl wa hayd*),[5,7,9,11] Deobstruent (*mufattīh sudad)*, Calorofic (*musakkhin)*, Detergent *(jāli),*[7,9,11] Resolvent (*muhallil-i-qawi)*, Gastrotonic (*muqawwi- i-meda)*, Vermicide (*qātil-i-dīdān 'ama)* and Abortifacient *(musqit-i-janīn)*.[9]

Therapeutic uses *(Iste'mal)*

Amenorrhoea (*Ihtibas-i-hayd)*, Inflammation of liver and spleen *(warm al-jigar wa tihāl),* Juandice (*yarqān),* Diseases of brain and nerves (*'asbi wa dimāgi amrāz*), *Ringworm (dād),* Leucoderma *(bars),*[7,9,11] Weakness of stomach (*zof-i-meda)*, Renal stone (*hisāt kulliya),* Dysuria *(usrul bawl),*[7] and Hepatic obstruction (*tasaddud-i-kabid)*.[5]

Dose *(Miqdar-i-khuraq)*: 3-5gm[9,11], 4gm[5,7]

Compound formulations *(Murakkabat)*:

- *Ma'jūn dabīd al-ward*[5,11]
- *Ro'ghan surkh*
- *Dawa-ul-kurkum*[11]
- *Ma'jūn-e-suparipak*
- *Araq-i-musaffi khūn qawi*[5]

Ethanobotanical description

Rubia cardifolia is a perennial, herbaceous, climbing or scrambling herb with red rhizomatous base & roots.[12]

- ✓ **Roots:** Long cylindric, flexuose, smooth reddish[13] with thin red bark.[4] The transverse section of the root shows almost a circular outline with irregular and at places exfoliated margins.
- ✓ **Stem:** Often very long, rough, grooved, slightly woody at the base.[5] It is quadrangular, divaricately branched, glabrous or prickly-hispid, especially on the angles.[12]
- ✓ **Leaves:** These are 1.6-3.5cm long, arranged in a whorl of 4, cordate-ovate to ovate- lanceolate, 3-9 palmately veined, upper surface mostly glabrous and rough. Lower leaves are larger than upper, and all are scabrous above. The margins are with minute white prickles.[4,12,13]
- ✓ **Flowers:** Fragnant, whitish or greenish yellowish or reddish, sweet-scented, small in terminal panicled glabrous cymes,[4,13] branches trichotomous, spreading; bracts ovate acute and leafy.[4]
- ✓ **Fruit:** They are 4-6 mm in diam. didymous or globose, smooth shining, 1-2 seeded, dark purplish or blackish when mature.[4,5,13]
- ✓ **Habitat:**Throughout India in hilly districts including temperate and tropical forests of Asian countries and Africa upto an altitude of 3750 m.[4,13,14]

Traditional therapeutic uses

- Amenorrhoea, erysipelas, ulcers, inflammations, urogenital disorders, piles, rheumatism, liver, gall bladder and uterine diseases.[6,8]
- Dysmenorrhoea, intestinal debility, jaundice, paralysis, dropsy, visceral obstructions, rickets and delayed bone consolidation.
- Dr. A. Bauer records favourble experiences in renal and visceral calculi, by giving a 1gm tablet of *madder* root thrice daily.[15]
- Preparation of root to hasten the inception of menstruation.[4]
- Infusion of the root as a drink to women after delivery to procure copious flow of Lochia.
- A paste made by rubbing up the roots with honey is a valuable application for freckles & other

discoloration of skin also in external inflammations.[8,15]

- Decoction of the leaves/root for pleurisy and other inflammatory conditions of the chest.
- Decoction of root to relive colic.
- Stem is prescribed as a cure for snake-bite and scorpion-sting.[4]
- The root paste mixed with the root paste of '*chitrak'* (*Plumago zeylanica* L.) and powder of whole plant of '*nagkesar'* (*Mesua ferra* L.) is given in typhoid fever.[10]

Chemical constituent

According to *Bucholz*, the constituent of madder are as follows; Resinous red coloring matter 1- 2%, extractive ditto 39%, reddish brown substances soluble in alcohol 1.9%, pungent extractive 0.6%, gummy matter 9%, woody fiber 22.5%, matter soluble in potash 4.6%, salts of lime with coloring matter 1.8%, water 12%.[8]

- **Roots and stem extracts:** Possess anthraquinones, glycosides, saponins, steroids, phenols, alimunium, iron, calcium, sodium and flavonoids.[14] The roots are rich in anthroquinones & their glycoside (around 20), the important one include purpurin (tri hydroxyl anthraquinone), munjistin (xanthopurpurin-2-carboxylic acid), pseudopurpurin (purpurin-3-carboxylic acid), free alizarin as well as its glucoside.[1,3,14]
- Three new anthracene derivatives, rubiasins A-C, were isolated from the combined roots & stems of *R. Cordifolia.*
- **Active principles:** Rubiacordone, rubiadin, rubicoumaric acid, rubifolic acid & 2 anti tumour cyclic compounds hexapeptides named RA-V & RA-VII.[1]
- **Coloring matter**: Red crystalline principle-purpurin, yellow principal glucoside- manjistin, garancin, alizarin (orange-red) and xanthine (yellow).[4,13]

Pharmacological studies

1. Anti-inflammatory effect

The ethanolic water extract of the plant showed significant anti-inflammatory activity at a dose of 10 & 20 ml/kg. The study was conducted in rats with carragenaan paw edema.[1,3]

2. Hepatoprotective activity

The hepatoprotective activity of an aquous methanol extract of *R. cordifolia* was investigated against acetaminophen and CCl4 induced hepatic damage. Acetaminophen produced 100% mortality at a dose of 1gm/kg in mice while pretreatment of animals with plant extract 500mg/kgreduced the death rate to 30%.[16]

3. Antioxidant effect

The in vitro antioxidant status of methanolic extract of roots and rhizomes of *R.Cordifolia* was determined. It shows lipid peroxidation inhibitory activity. The study concludes that *R. cordifolia* has an anticholenergic activity which may be attributed to antioxidant activity due to the presence of Rubiadin.[2]

4. Anti-acne

Presence of phenolic compound in *R.cordifolia* acts as promising anti-acne agent because it inhibits the proliferation of Propioni bacterium acnes.[2, 17]

5. Immunomodulator

The ethanolic extract of root of *R.cordifolia* was used in a dose of 50mg/kg or 100mg/kg or 200mg/kg on pyrogallol and ethanol induced immunosupression. It stimulate humoral and cell mediated immunity.[18]

6. Neuroprotective

R.cardifolia has been shown to exert neuroprotective properties via preventing the depletion & increasing GSH (glutathione) levels by inducing GCLC (c-glutamylcystiene ligase). The protective ability may be attributed to the GSH & vitamin C content of herb. It was studied on beta-amyloid induced cognitive dysfunction in mice.[19]

7. Anti-bacterial activity

The anti-bacterial activity of the extract of *R. cordifolia* root was evaluated by the agar-well diffusion method. Chloroform & methnol extract of *R. cordifolia* was found to be more specific towards the gram positive strains. It was significantly active against B. subtilis & S. aureus compared with streptomycin & penicillin G used as standards.[2]

8. Anti-diabetic activity

The hypoglycemic activity of alcoholic extract of roots of *R. cordifolia* was studied in normal, glucose fed and alloxan induced diabetic rats. The extract reduced the blood sugar level because it enhanced GABA levels and decreased brain dopamine and plasma corticosterone levels.[17]

9. Anti-tumour activity

Anti-tumour activity of RC-18, a pure isolate from *R. cordifolia* was repeatedly tested in different sets of experiments on a spectrum of experimental murine tumours, viz. P388, L1210, L5178Y, B16 melanoma. RC-18 exhibited significant increase in life span**.**

10. Anti-HIV

92 extracts were prepared from 23 plants. Anti-HIV activity was measured in a human CD4+ Tcell line, CEM-GFP cells infected with HIV-1NL4.3. Nine extracts of 8 different plants including *R. cordifolia* significantly reduced viral production in CEM-GFP cells anddemonstated promising anti-HIV potential.[1]

CONCLUSION

This review is an attempt to unite available information regarding its phytochemistry, traditional uses and biological activities. The extensive survey of literature revealed that *Rubia cordifolia Linn*. is an important

traditional medicinal plant with diverse medicinal properties with an array of pharmacological activities. The clinical-based studies confirmed that it plays an important role in the prevention and management of various diseases. Further, evaluation needs to be carried out to explore its practical application.

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