

Rose Madder-A review on pharmacognosy and phytochemistry

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Abstract

Rose Madder, or *Rubia cordifolia* (Family: Rubiaceae) is a stretched climber with little, greenish white blossoms that are masterminded in a bunch of round, beefy, purple organic products. Its foundations have an earthy red bark from which a red color is gotten. This plant develops well in uneven regions, and the root has therapeutic qualities. Rose Madder is thought to be a standout amongst the most important herbs in Ayurveda. It is broadly endorsed in different sicknesses particularly in the treatment of Yarqaan (Jaundice), Visceral check and Faalij (Paralysis). Plant has numerous pharmacological activities like blood purifier action, anticancer, astringent, antidysentric, clean, deobstruent properties and antirheumatic, hepatoprotective. The plant contains different compound constituents like anthraquinones, iridoids, hexapeptides, rubiprasins, quinones, and triterpenoids. The plant coantains significant measures of anthraquinone particularly in the roots, the shading matter present in the root is a blend of purpurin (trihydroxyanthraquinone) and munjisthin (xanthopurpurin-2-carboxylic corrosive) having antitumor properties. It additionally has radioprotective, anticancer and cell reinforcement, antihyperglycemic, antistress, antimicrobial, hostile to inflammatory, astringent and antidysentric properties. The roots are extremely viable in filtering blood and utilized as purgative, pain relieving, lactogogue, emmanogogue, diuretic and are utilized as a part of blemishes, loss of motion, torpidity, growth of spleen, agonies in the joints, stiffness and uterine torments. The stem is portrayed as a cure for snake chomp and scorpion sting. Aside from its therapeutic esteem, this plant has likewise been utilized as characteristic nourishment colorants and as a characteristic hair color.

Key words: Rubiaceae, Antitussive, Essential oil, Manjith, Asia

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1. Introduction

Rubia cordifolia of Rubiaceae family generally known as "Manjit" is a perennial climbing herbaceous plant developing wild in northern bumpy zones of Pakistan. The plant has been utilized to color cotton, silk and wooly pieces of clothing since old time. Dried roots are thought to be valuable in lightening dropsy, loss of motion, jaundice, amenorrhoea and instinctive obstructions. Indian Madder was a financially essential wellspring of a red shade in numerous districts of Asia, Europe and Africa. It was broadly developed as of ancient history while waiting for the mid-nineteenth century. The plant's underlying foundations contain a natural compound called Alizarin, which gives its red shading to a material color recognized as Rose madder. It was additionally utilized as a colorant, particularly for dye, that is alluded to as Madder Lake. Blooming season June to August [1-2]. *Rubia cordifolia*, frequently identified as common madder, rose madder or Indian madder, is a species of flowering plant in the coffee family, Rubiaceae. There are three main madder floras, European Madder

(*Rubia tinctoria*), Asiatic Madder (*Rubia argyi*), and Indian Madder (*Rubia cordifolia*) [3]. But *Rubia cordifolia* is considerable common than other *Rubia* species in colorant and drug industries. Arabic Name are Arook Ahmer and Fuvvaj, Fovah, Fovah-ul-Sabageen, Fova h-uk-Sabag, in china it is called as Qian cao gen [4], Bengali Name are Manjistha and Manjith [5], English Name is Indian Madder [6], French Name is Garance de l'Inde, German Name is Ostasiatischer Krapp, Greek name is Albisam, Kashmiri name is Dandu, Gujarati Name is Manjitha [7], Hindi Name are Manjith and Majith [8], Kannada Name is Manjustha, Latin name is *Rubia cordifolia* Linn., Marathi Name is Majith, Persian Name is Rabunas, runas, Rudak, Punjabi Name are Kupaiphali, Khuri, Runang, Tiuru, Manjistha, Majit and Manjit [9], Sanskrit Name are Manjishtha, Yojnavalli and Urdu Name is Majeeth, Manjit, Manjith and Majith [10-11].

The essential oil constituents of Rose Madder is thought to be identified with developing condition, geographic roots, hereditary components, diverse chemo

sorts and contrasts in the healthful status of plants. Colorings matter present, which is a blend of purpurin and munjistin. Alizarin and its glucoside are also present in the plant. Essential oils (EOs) possess number of medicinal properties like antimicrobial [12], antioxidant [13] and anticancer etc. Due to these properties, EOs have great importance in various industries like food and flavor, fragrance and pharmaceutical etc. [14].

2. History/Origin

It is the nearby of North-East Asia from Dahuria to Japan, Java and tropical Africa. Early proof of coloring originates from Indus waterway human development wherein a bit of yarn colored with madder has been recouped from the archeological website online at Mohenjodaro Pakistan (0.33 thousand years BCE). The maximum installed European materials colored with madder originate from the grave of the Merovingian ruler Arnegundis in Saint Denis near Paris (in 565 and 570 AD). Turkey purple becomes a strong, quick red color for yarn got from madder root. Turkey pink turned into created in India and unfolds to Turkey. Greek experts familiar with the techniques for its creation had been gotten to France 1747, and Dutch and English spies quickly located the thriller. A cleaned rendition of Turkey crimson turned into being created in Manchester by using 1784, and roller published get dressed cottons with a Turkey purple ground were in trend in England by means of the 1820s [15].

3. Demography/Location

The development of Madder needs sub-tropical atmospheres and lean towards wet soil. The plant develops well in loamy soil and a perpetual level of dampness. It is developed in the base of Himalayas in enormous amount. Rose Madder develops in Southeast Asia, China, tropical Africa, and India. The herb is local to the Old World as well as parts of Africa and calm Asia, for example, Japan, Sri Lanka, India and Indonesia. Madder is additionally found in America and Southern parts of Europe. It is overwhelmingly found in the Himalayas and this enduring climbing herb is developing wild in northern sloping territories of Pakistan [7].

4. Botany, Morphology, Ecology

Rubia cordifolia is an enduring herbaceous hiker, which is from 1 to 2 meters in tallness. Purple or orange-red root is barrel shaped, meaty, and with red or pink cut outward. After dried, the surface gets to be distinctly ruddy cocoa or dim chestnut and purple and the disjointed surface turns fuchsia. Stems are harsh, however young twigs have clear 4 edges that are with little anatroous spines. Straightforward leaves are generally in whorls of 4; leaf cutting edge is praise or applaud lanceolate, 2 to 9cm long, 1 to 4cm wide, and with intense zenith, cordate or adjusted base, coarse foliage, and modest anatroous spines on the dorsal veins and edges; petioles are in various length and with little anatroous spines. Blossom time is from August

to September. Light yellow blossoms organize in cymes at the highest point of branches or leaf axils; calyx teeth are out of date; corolla tube is short and 5-lobed; stamens are 5. Fruiting time is from August to October. Natural products are almost circular, around 6mm in width, red, or from purple to dark when ready. Primary living spaces incorporate hillslopes, roadside, trench groups, edge of the rice field, bushes and backwoods edge. Manjit is an enduring climbing herb, which can develop to 1.5 m in stature. The evergreen leaves are 5-10 cm long and 2-3 cm wide, delivered in whorls of 4-7 star like around the focal stem. Leaves are applaud heart molded; whole, pointed, heart formed at base, once in a while adjusted, 3-9 palmate veined, upper surfaces generally bald and unpleasant. It moves with modest snares at the leaves and stems. The blossoms are little, 3-5 mm over, with five light yellow petals, in thick racemes, and show up from Fruit is a little red to dark berry, 4-6 mm breadth. The roots can be over a meter long, up to 12 mm thick [16]. The normal madder can cultivate up to 1.5 m in tallness. The perennial leaves are roughly 5-10 cm long and 2-3 cm expansive, delivered in whorls of 4-7 star like about the focal shoot. It moves through little snares at the greeneries and stems. The blooms are little (3-5 mm over), with five light yellow petals, in thick racemes, and show up from June to August, trailed by little (4-6 mm width) red to dark berries. The roots can be over a meter long, up to 12 mm thick. It leans towards loamy soils (sand and dirt soil) with a consistent level of dampness [17-19].

5. Chemistry

5.1. Chemical composition

In order to find out chemical composition of oil extracted from the plant, generally GC-MS analysis is used [20-22]. Rose Madder contains Anthracene derivatives such as alizarin, rubian, rubiadin, ruberythric acid, purpurin, purpurin carboxylic acid, Pseudopurpurin, xanthopurpurin, quinizarin and lucidin. It contains a variety of quinones, iridoid glycosides, triterpenoids, and beta-sitosterol. Its principal constituents are purpurin, munjistin, xanthopurpurin or purpuroxanthin and Pseudopurpurin [9-23]. The roots comprise resinous and extractive material, gum, sugar, shading matter, the salt of the color actually a red crystalline rule purpurine. The yellow glucoside manjistin and a xanthine likewise exist, other than garancin and orange red alizarin. Anthroquinones pentacyclic triterpenes, quinines, cyclic hexapeptides and diethylesters are additionally present. Different mixes disengaged are xantho-purpurin, glucose, sucrose and ruberythric corrosive. Alizarin, purpurin, purpurin starch, quinizarine and christofin separated from roots [24-25].

5.2. Phyto-chemistry

Rubia cordifolia (Majeeth) fundamentally identified for its anthraquinones and naphthohydroquinones phytochemical constituents. The foremost phytoconstituents

of *Rubia cordifolia* included Rubiadin, Rubicordone A16, Rubiasins AC17, Rubiatrionol (triterpenoid), 6-methoxygeniposidic corrosive an iridoid glycoside, two pentacyclic triterpenoid-Rubicoumaric corrosive and Rubifolic corrosive. Mollugin, fuomollugin, dehydro-alpha-lapchone are segregated as of chloroform part. The essential chromophores present in *Rubia cordifolia* are alizarin, purpurin, pseudopurpurin xanthopurpurin, munjistin, rubiadin. The greater part of the chromophores share the base 9,10-anthraquinone construction however with various utilitarian gatherings at carbons 1-4 [3-16-26]. Purpurin (trihydroxy anthraquinone) and munjistin (xanthopurpurin-2-carboxylic corrosive) are the primary shading standards of *Rubia cordifolia*. Furthermore, xanthopurpurin or purpuroxanthin and pseudopurpurin, garacin, alizarin (orange red) and xanthine (yellow) are also account for shading standards of *Rubia cordifolia*. Roots comprises resinous red shading matter (1.2%), extractive matter (39%), rosy chestnut substance solvent in liquor (1.9%), sticky matter (9%), woody fiber (22.5%), matter dissolvable in potash (4.6%), salts of lime with shading matter (1.8%) and water (12%) [18-27]. However, composition is entirely depends on different seasons [14].

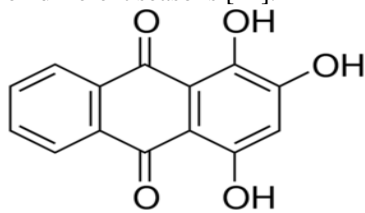


Fig.1. Structure of Purpurin

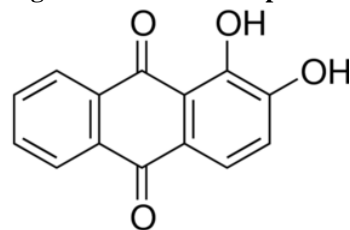


Fig.2. Structure of Alizarin

6. Value addition

Rubia cordifolia was a monetarily vital source of a red shade in several areas of Asia, Europe and Africa. It was broadly developed from olden times until the mid-nineteenth century. The plant's underlying foundations contain a natural compound called Alizarin, which gives its red shading to a material color known as Rose madder. In locales of Asia, Africa and Europe, *Rubia cordifolia* was a monetarily imperative source of a red shade called Alizarin. It was likewise utilized as a colorant, particularly for paint, called as Madder Lake [28].

7. Uses

7.1. General Uses

Utilized as a color plant in Asia where red color separated from roots and stems have been utilized to color silk, material, cotton textures (chintz) and woolen covers. Establishes utilized as fixing in ink formulas. In South

Africa, roots are utilized to color fleece. In Ethiopia, it is used to color fleece and bread wicker bin in shades of pink, red, purple or maroon. Roots are essential fixings in red ink formulas. Juice of squashed natural products utilized as green to somewhat blue ink. The stems are utilized as a part of Tibetan prescription, where they are considered to have a severe taste and a cooling power. The fundamental uses of *Rubia cordifolia* are antiphlogistic, antitussive, astringent, diuretic, emmenagogue, expectorant, styptic, tonic, and vulnerary. They are utilized to lower pulse, and in addition or the treatment of unusually uterine dyeing; inner and outside drain; bronchitis; ailment, stones in the kidney and bladder etc. The roots and organic product are utilized as a part of treating loss of motion and states of ulcer. The stem is utilized for treating cobra nibble and scorpion sting. It is also utilized for the treatment of liver fluke, looseness of the bowels, hatchlings and intestinal worms. Roots are utilized to treat rheumatoid, joint pain, loose bowels, infection, skin illnesses, diabetes, ulcers, and wounds. Roots have hepatoprotective action and also valuable for breaking down and end of urinary stones. Different chemical constituents present in plant indicated mitigating action. The roots are valuable in irritations, and maladies of uterus. It is used as blood purifier, and helpful in urinogenital, skin and urinary issues. *Rubia cordifolia* are accounted for to have antiviral, antibacterial, cell reinforcement, and hostile to platelet actuating movement. The plant indicates antitumor action. In Indonesia, leaves are utilized as side dish with rice. In prior circumstances, madder was utilized for giving amenorrhea in ladies. Amenorrhea is the condition when a lady neglects to bleed routinely. In Indian society drug, madder is thought to be a powerful blood cleanser. The herb is likewise utilized to purify the liver, uterus (a type of post-natal treatment) and the pancreas. Additionally, the product of madder is utilized to treat hepatic deterrents. Rose Madder has been utilized customarily as a liver and kidney detoxifier. Rose Madder is advantageous in treating skin conditions like uneven pigmentation and dermatitis. Generally, it was utilized to help break down tumors and also help broken issues that remain to be worked out. Rose Madder is thought to be the most prestigious blood-detoxifying herb. Rose Madder likewise is by all accounts very helpful in treating nervousness. This activity might be to some degree because of its capacity to raise dopamine levels. Rose Madder also generally utilized for treating pimples, decreasing wrinkles, enhancing appearance, treating blazes, mending wounds and reducing aggravations. In the Philippines pull decoction utilized for specific issue of the urinary tract. Around the world, it is well known for its utilization in skin sicknesses like dermatitis and skin ulcers. Likewise utilized as a part of ailment, bronchitis, renal lithiasis and looseness of the bowels [29]. It is additionally viewed as valuable in keeping up ordinary circulatory strain and smooth blood stream [27].

7.2. Pharmacological uses

Rose Madder unrefined concentrate can raise white platelet number. Its decoction has critical antitussive and cough medicine impacts. Its water extricate has certain restraint on *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Bacillus influenza*, and some membrane organism. It can repress the accumulation of calcium stones. A few chemicals in madder may help to diagnose kidney stones. Alizarin present in madder may obstruct a protein that is required by the HIV infection to imitate. Madder (Indian madder) plant also possesses different properties like calming, astringent, hepatoprotective, antiplatelet and deobstruent. The Chinese pharmacologist trusts that it is severe in essence and cools in wildlife and it spirits to liver meridian. Normal abilities are freezing blood, halting dying, evacuating stability, and empowering menstrual seeping to reestablish normal cycling. Prescribed dose is from 6 to 9 grams in decoction, powder, and pills [30]. Another famous utilization of madder is in regarding and additionally averting kidney stones in people. It has been originated that madder prompts to calcium oxalate crystallization and this procedure assistances in liquifying kidney stones. Madder is additionally utilized inside and used for the various treatments of skin diseases. The herb is prescribed for the treatment of overflowing, varicose veins, rashes, bubbles, emissions and edema. It is additionally utilized remotely to dry injuries and in ulcer dressing. Madder decoction is likewise used to wash incessant injuries. The roots, leaves and seeds of the herb are valuable for amenorrhea, liver ailments and bother bladder and spleen diseases [23-31]. Rose Madder helps in blood refinement and purging of the lymphatic framework. It enhances skin wellbeing. It recuperates harmed skin muscle and clears dim spots. It can likewise be utilized as a face pack in blend with different herbs like turmeric, sandalwood powder and orange peel. It boosts strength of the urinary track. It assistances in detoxification and expels poisons discharges in the blood when the liver, pancreas or different organs experience detoxification. It keeps up solid gums [32]. The useful herb has indicated very successful outcomes against different hypersensitivities, for example, over the top sniffing, nasal tingling, stuffy nose, release and so on. In various sensitivities, this natural cure is utilized for right around 1-2 months. The *Rubia cordifolia* are exceptionally useful in treating a few sicknesses identified with liver. Furthermore, it enhances the quality of liver and different organs of the body. The roots and leaves of this extraordinary herb have been proved exceptionally valuable in treating various types of growths including lymphoma. In the event of elevated cholesterol and diabetes, the astounding home grown cure of *Rubia cordifolia* has conveyed superb outcomes. The tablets or containers of the dried roots and stems are utilized for the treatment of these issues. The stem of this natural plant is utilized of the treatment of cobra and scorpion chomp.

Similarly, it is additionally useful in evacuating intestinal worms and larvae in creatures.

7.2.1. Anti-cancer activity

The cyclic hexapeptidel and quinones of *Rubia cordifolia* exhibited an important anticancer action in contradiction of numerous proliferating cells [4]. The hexapeptides exhibited effective antitumour activity by compulsory to eukaryotic 80S ribosomes, resulting in reserve of aminoacyl-tRNA binding and peptidyl-tRNA translocation, thus foremost to the slowdown of protein synthesis. Rose Madder herb has several anti-cancer compounds including epoxymollugin [5-11-33-34].

7.2.2. Anti-microbial activity

The medicinal plant has been used extensively in traditional Asian drug for its antibacterial [35], antioxidant and anti-inflammatory actions [27-36-37]. The key segments of Rose Madder incorporate purpurin (trihydroxy anthraquinone), munjistin (xanthopurpurin-2-carboxylic corrosive), pseudopurpurin (purpurin-3-carboxylic corrosive) and free alizarin along its glucoside. These chemical constituents give antibacterial, expectorant and diuretic properties to the herb. As an antimicrobial agent, Rose Madder has been used against microbes and in addition against infections, especially HIV infection. Antibacterial action of ethanolic concentrate of *Rubia cordifolia* assessed against ESBL (Extended Spectrum Beta-Lactamase) creating urinary *E.coli* disease. The plant as proved to have excellent antibacterial properties. Methanolic concentrate of *Rubia cordifolia* indicating ameliorative impact in N-nitrosodiethylamineinduced hepatocellular carcinoma in rats. Mitochondrial catalysts and respiratory chain proteins, which diminished in Nnitrosodiethylamine treated rats, expanded fundamentally in *Rubia cordifolia* treated rats. The levels of hydroxyl radicals and lipid peroxidation likewise diminished. Histological investigation of liver affirmed the aversion of obsessive changes created by Nnitrosodiethylamine, which propose that *Rubia cordifolia* might be produced as a viable chemotherapeutic agent [38].

7.2.3. Anti-inflammatory effect

Rubia cordifolia roots are generally utilized as calming, antiulcer, antidyenteric, and blood purifier. *Rubia cordifolia* controlled the edge oxygenase protein pathway and the creation of cumene hydroperoxides. The lip oxygenase pathway catalyzes the creation of various inflammable go between, for example, the leukotrienes which are included in asthma, joint inflammation and other fiery issue. The therapeutic plant Rose Madder has been utilized generally in conventional Asian solution for its antibacterial, cell reinforcement and mitigating exercises [38-39]. Rose Madder alleviates torment brought about by irritation, for example, a tooth hurt, quits dying, and expels blocks in the circulatory system, liver, and kidneys. It can help every incendiary state of the blood and female conceptive framework. It can help break up irregular

developments in the tissues. Rose Madder can enhance blood stream and advance mending of broken bones and tissue harmed by damage or disease. It might help with sexually transmitted maladies [27-38].

7.2.4. Anti-diabetic activity

Rubia cordifolia has shown action against allergies, bacterial infection, unnecessary bleeding and diabetic ulcer [25-40].

7.2.5. Antioxidant activity

Antioxidant properties of plant are due to the presence of phenolic or flavonoid components [13]. The herb altogether controlled FeSO₄-initiated lipid peroxidation and glutathione consumption. The action was credited to the quinone rubiadin. The therapeutic plant Rose Madder has been utilized broadly in customary Asian medication for its antibacterial, cell reinforcement and calming exercises. They have an antibacterial activity, restraining the development of *Staphylococcus aureus*, *S. epidermidis*, *Pneumococci* etc. [25-39].

8. Summary

Rose Madder, or *Rubia cordifolia* (Family: Rubiaceae) is a stretched climber with little, greenish white blossoms that are masterminded in a bunch of round, beefy, purple organic products. Its foundations have an earthy red bark from which a red color is gotten. This plant develops well in uneven regions, and the root has therapeutic qualities. Rose Madder is thought to be a standout amongst the most important herbs in Ayurveda. It is broadly endorsed in different sicknesses particularly in the treatment of Yarqaan (Jaundice), Visceral check and Faalij (Paralysis). Plant has numerous pharmacological activities like blood purifier action, anticancer, astringent, antidysentric, clean, deobstruent properties and antirheumatic, hepatoprotective. The plant contains different compound constituents like anthraquinones, iridoids, hexapeptides, rubiprasins, quinones, and triterpenoids. The plant contains significant measures of anthraquinone particularly in the roots, the shading matter present in the root is a blend of purpurin (trihydroxyanthraquinone) and munjisthin (xanthopurpurin-2-carboxylic corrosive) having antitumor properties. It additionally has radioprotective, anticancer and cell reinforcement, antihyperglycemic, antistress, antimicrobial, hostile to inflammatory, astringent and antidysentric properties. The roots are extremely viable in filtering blood and utilized as purgative, pain relieving, lactagogue, emmanagogue, diuretic and are utilized as a part of blemishes, loss of motion, torpidity, growth of spleen, agonies in the joints, stiffness and uterine torments. The stem is portrayed as a cure for snake chomp and scorpion sting. Aside from its therapeutic esteem, this plant has likewise been utilized as characteristic nourishment colorants and as a characteristic hair color.

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