A COMPREHENSIVE REVIEW ON MANJISHTHA (RUBIA CORDIFOLIA L.) WITH SPECIAL REFERENCE TO AYURVEDIC AND MODERN ASPECT

Dr. Bharti Sadabal1*, Dr. T.A.Pansare2. and Dr Sachin Govindrao Tike3

1PG Scholar (Dravyaguna) Govt. Ayurved College, Osmanabad, Maharashtra 413501
2Associate Professor (Dravyaguna), Govt. Ayurved College, Osmanabad, Maharashtra 413501
3Assistant Professor and Incharge H.O.D. Dept of Panchkarma Govt Ayurved College, Osmanabad

ABSTRACT

Medicinal plants have an imperative role to preserve the disease free healthy human life. Manjistha (Rubia cordifolia L.) belonging to Family Rubiaceae is traditional and medicinal standards towards a disease free population. It is frequently prescribed in various indigenous systems of medicine like Ayurveda. In Ayurvedic classics various properties of Manjistha such as varnya (beneficial for complexion), swarya (improves voice), jivarahara (reduces fever), vishaghna (detoxifies), kashthaghna (useful in skin disorders), raktavikarhar (beneficial in blood disorders), vranahar (wound healing), prameaghna (useful in diabetes), shothahar (anti-inflammatory), yoni-netra and karnavikarhar (useful in uterine -eye and ear disorders), Arshoghna (cures piles) etc. are well described. It is also well known rasayana (rejuvenative). Acharya Sushruta has mentioned Manjistha as pittasamsamana (which pacifies the pitta dosha). Manjistha has valuable effects resembling anti-carcinogenic, anti-acne, immunity-enhancing, anti-oxidant, anti-inflammatory, hepato-protective, cardio-protective, gastro-protective, neuro-protective, nephro-protective and many other pharmacological activities. Literature describes the luxurious effects of Rubia cordifolia to treat number of diseases including cancer, alzheimer, diabetes, acne, inflammation, allergy, enterocolitis and bacterial and viral infection. The phytochemical constituents like anthraquinones, glycosides, saponins, steroids, phenols, and flavonoids, alkaloids, tannins etc. were found as a major medicinal value, Manjistha has also been used as natural food colorants and natural dyes. Coloring pigments present in the roots are munjistin and purpurin in large amounts. Madder root extract has investigated for its dying characteristics and yielded and hepatoprotective and are extensively used against blood, urinary and skin diseases. In prehistoric, Manjistha as an efficient blood cleanser or purifier and hence is widely used beside blood, urinary and skin diseases. Externally, Manjistha was applied on major burns, mixed with honey on freckles. It is a potent drug for persistent skin diseases like eczepelas, leucoderma, and inflammation also used to reduce fever and against blood disorders in Ayurveda. conventionally, it is used in many herbal formulations for various cosmetic preparations because of its antiseptic, inflammatory, and galacto-purifier activity. Root is used internally and externally to gain shine and glow of the skin and aids to remove pimples, freckles and discoloration. Apart from its medicinal value, Manjistha has also been used as natural food colorants and natural dyes. Coloring pigments present in the roots are munjistin and purpurin in large amounts. Madder root extract has investigated for its dying characteristics and yielded

INTRODUCTION

The interest of Public, academic and government in traditional medicines is growing exponentially because of the increased incidence of the adverse drug reactions and economic burden of the modern system of medicine[1]. The herbal medicines are relatively safer than artificial drugs[2,3]. In Ayurveda, there are a number of natural crude drugs that have the potential to treat different disorders, one of the important drug is Rubia cordifolia Linn. It is also known as Indian Madder. It is a perennial, herbaceous prickly climber with long and cylindrical root with a thin red bark, admired for its versatility action. It is distributed in the hilly area of Himalayas from Kashmir eastwards and Nilgiris[4]. One of its very good actions is anti-acne effect through anti-bacterial, anti-inflammatory, anti-oxidant and anti-androgen action. The roots and stems are well known source of Anthraquinones, it also been reported as antioxidant, anti-inflammatory, anticancer, immunomodulator and hepatoprotective and are extensively used against blood, urinary and skin diseases[5,6]. In prehistoric, Manjistha as an efficient blood cleanser or purifier and hence is widely used beside blood, urinary and skin diseases[7]. Externally, Manjistha was applied on major burns, mixed with honey on freckles. It is a potent drug for persistent skin diseases like ecysipelas, leucoderma, and inflammation also used to reduce fever and against blood disorders in Ayurveda. conventionally, it is used in many herbal formulations for various cosmetic preparations because of its antiseptic, inflammatory, and galacto-purifier activity[8]. Root is used internally and externally to gain shine and glow of the skin and aids to remove pimples, freckles and discoloration[9]. Apart from its medicinal value, Manjistha has also been used as natural food colorants and natural dyes. Coloring pigments present in the roots are munjistin and purpurin in large amounts. Madder root extract has investigated for its dying characteristics and yielded

Copyright © Dr. Bharti Sadabal, Dr. T.A.Pansare, and Dr Sachin Govindrao Tike, 2020. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

*Corresponding author: Dr. Bharti Sadabal
PG Scholar (Dravyaguna) Govt. Ayurved College, Osmanabad, Maharashtra 413501
beautiful orange red to scarlet shades when applied onto the woolen yarn. Manjishtha contains active constituents like anthraquinones, glycosides, saponins, steroids, phenols, and flavonoids, alkaloids, tannins etc. which are responsible for its therapeutic efficacy. It exhibits various pharmacological effects like anti-carcinogenic, anti-acne, immunity-enhancing, anti-oxidant, anti-inflammatory, cardio-protective, gastro-protective, heptato-protective, neuro-protective, nephro-protective etc. The present paper is an endeavor to draw attention to Ayurvedic information, diverse pharmacological activities and medicinally active phytoconstituents of Manjishtha and provide medicinal values of this valuable herb to scientific communities. The rich heritage of traditional drug, ‘Manjishtha’ is evaluated in this review to provide broad and distinctive information which will be helpful to researchers and pharmaceutical industries to develop the pharma worth of this wonder drug.

**Vernacular Names**

**Sanskrit:** Manjishtha, Viksa, Yojanvalli  
**Hindi:** Manjistha  
**Marathi:** Manjit  
**Bengali:** Manjishtha  
**Gujarati:** Manjistha  
**Tamil:** Manjittii  
**Telugu:** Tamravalli  
**Kanad:** Manjishtha  
**Malayalam:** Manjishi  
**English:** Indian madder

**Ayurvedic Properties**

- **Rasa:** Tikta (bitter), kashaya (astringent), madhur (sweet)  
- **Guna & Karma:** madhura and kashaya in rasa
- **Veerya:** Madhurya in veerya
- **Vipaka:** Verna
- **Katu:** Tikta in rasa, guru
- **Guna karma:** madhura, kashaya and tikta in rasa
- **Ushna:** Ushna in veerya
- **Katu (pungent):** Tikta, kashaya, madhur (sweet)
- **Vipaka:** Verna
- **Karma:** Varnaropana, Jwarhara, shothahar, kushthaghna.
- **Manjishtha in Nighantu’s**

**Bhavprakash nighantu**

Synonyms: Manjishtha (A reputed drug for purifying blood), vikasa (An extensive spreading climber), samang (It spreads in all directions), kalmeshika (Roots are black on completely druing), mandakarni (It is spreading like Mandakarni), bhandi, bhandi (Colour resembling the blacked pot), bhandi, bhanditiki (An extensive spreading climber), yojanvalli (An extensive spreading climber), rasayani (A blood purifier which maintains normal health), kala (Roots are black in colour), raktangi (The roots are red when fresh), raktangi, aruna (The stem are red in colour), gandhri (Alleviates glandular swellings), manjusha (Purifies the blood and gives complexion to the body), and vastraranjini (Used for dyeing cloths).

Manjishtha possesses madhura, tikta, and kashaya rasa. It enhances voice and improves complexion. It is guru and ushna in veerya and is used in dealing of vishna (poison), kapha, shotha (inflammation), yoni (menstrual), netra (eye diseases), and karna (ear related diseases) disorders, raktatisara (desentry), kushtha (skin diseases), raktadosha (bood related), visarpa (erysipelas), vrana (wound), and prameha (diabetes).

**Dhanvantari nighantu**

Synonyms: Kalameshi, samanga, vikasa, aruna, manjuka, raktayashthi, bhandi, yojanvalli, kshetrinki, vijay, rakta, raktangi, vastrabhushana (used for the dueing of cloths), jingi, bhandi, kala, gandali, and kalameshika.

Guna karma- manjishtha is madhura and kashaya in rasa ushna in veerya and guru. It treats kapha, ugra vrana......, prameha, raktavikara, visha and netraroga.

**Madanapad nighantu**

Synonyms: Manjishtha (A reputed drug for purifying blood), vijay, rakta, raktangi, kalameshika, raktayashthi, tamravalli (Coppy when half-dried), samanga, vastrabhushana(used for the dueing of cloths), manjula (A reputed drug for purifying blood), vikasa, bhangi, chadhika, jwaranashini (Act as anti-pyretic).

Guna and karma- madhura, kashaya and tikta in rasa and is golden in colour. It is guru and ushna in property and wins over visha, kapha, shopha......, yonisheel, netrasheel, raktatisara, kushtha, rakta, visarpa, vrana, and prameh. Shaak of manjishtha has deepana property and possess madhura rasa and wins over pitta and vata.

**Kaidev nighantu**

Synonyms: Raktangi, raktayashthi, chadhaka, manjula, bhandi, bhandira, samanga, vikasa, vastrabhushana, tamrula, tamravalli, kalmeshi, jingi, yojanvalli.

Guna and karma- madhura, kashaya, and tikta in rasa, guru in property, ushna in veerya and enhances voice quality. It use in ear and eye disorders, vaginal disorders, kapha, shotha, visha, visarpa, prameha, kushtha, arsh (arsha), vranavikara, and rakta.

Shaak of manjishtha is sweet in taste, laghu, snigdha and has agrideepak ......property and wins over vaat and pitta.

**Description of Plant**

It is a perennial, prickly climber with a stem, growing up to 12 m long. Leaves are highly variable, ovate lanceolate, 5-7

**Taxonomic Classification**

- **Kingdom:** Plantae  
- **Class:** Dicotyledoneae  
- **Subclass:** Sympetala  
- **Order:** Rubiales  
- **Family:** Rubiaceae  
- **Genus:** Rubia  
- **Species:** cordifolia.

**Availability of Manjishtha**
It occurs throughout India (Dehradun, Kashmir, Nagpur, Malva, and Chitrakoot), Nepal, Shrilanka, Iran, and Afghanistan. It is propagated by seeds and stem — cutting. According to Raja Nighantu, Manjishtha has four types; Chola, Yojani, Konchi and Sinhal[61]. Manjishtha has also three species like Rubia cordifolia (Indian madder), Rubia akane (Asian madder) and Rubia tinctorum (European or African madder)

API Standards as are follows

Manjishtha- Rubia cordifolia Linn.[21]

part used- Stem
Foreign matter: Not more than 2%, Appendix 2.2.2
Total ash: Not more than 12%, Appendix 2.2.3
Acid –insoluble ash: Not more than 0.5%, Appendix 2.2.4
Alcohol-soluble extractive: Not less than 3%, Appendix 2.2.6
Water-soluble extractive : Not less than 17%, Appendix 2.2.7

Macroscopic and Microscopic Examination

Stem: is quadrangular, divaricately branched, prickly-hispid, Cross section of the stem showed rectangular outline with single layered epidermis covered with cuticle and pyramidal hairs. Hypodermis sclerenchymatous present at the corners of the stem. The cortex is photosynthetic chlorenchymatous, Phloem 4-6 layered, composed of sieve tubes and phloem parenchyma. Cambium ring is represented by two layers. Secondary xylem is made up of vessels, tracheids, fibers and xylem parenchyma. vessels are large and uniformly arranged. Medullary rays are uniseriate.

Leaves: glabrous and rough 3.8-9 × 1.6-3.5 cm long, arranged in whorls of four, ovate-lanceolate, 3-9 palmately veined. Lower leaves are larger than the upper. Leaf base is slightly cordate. The margins are with minute white prickles. Leaf section showed solitary layered epidermis, enclosed among cuticle and possesses pyramidal hairs. Palisade cells are single covered and closely filled, spongy cells multilayered and loosely arranged. In the lesser portion of the midrib 2-4 layers prepared of collemenchymatous cells. Vascular bundles are collateral and closed, conjoint and definite in number.

Petiole: 5-10 cm long with sharp, recurved prickles. Stipules absent or modified into leaves. The T.S. of the petiole showed single layered epidermis with pyramidal hairs. Below the epidermis, 3-4 layers of sclerenchymatous cells were present. The cortical cells were made of thin-walled chlorenchyma. The vascular bundle is ‘C’- shaped.

Root: is long, cylindrical, flexuose, smooth and reddish. The cross-section of roots showed an outer 5-7 layer of cork tissue, which occasionally contains tannin. Phellogen is not distinct. Secondary cortical cells thin-walled, red in color and polygonal in shape. Secondary xylem dish consists mainly of vessels and tracheids. Vessels are abundant and distributed uniformly. Secondary phloem forms a wide zone of reddish color consists of thin-walled, sieve elements and phloem parenchyma but lacks phloem fibers. Cambium is distinct and lacks medullary rays. The whole portion of the root is red coloured indicates the presence of anthraquinones.

Phytochemical Studies

Rubia cadifolia has mainly anthraquinone, quinines glycosides and include 1-hydroxy 2-methoxy anthraquinone, 1, 4-
dihydroxy-2- methyl-5-methoxy anthraquinone, 1,3- dimethoxy 2- carboxy anthraquinone and rubiadin. Also possesses different classes of bioactive compounds such as anthraquinones and their glycosides, naphthoquinones and glycosides, terpenes, bicyclic hexapeptides, iridoids[24]. Rubia cordifolia yielded anthraquinones namely, 1,hydroxy-2 carboxy 3-methoxy anthraquinone, 1,6-dihydroxy-2 methyl 6 or 7-methoxy-anthaquinones and other compounds oleanolic acid acetate, β-sitosterol, and scopoletin. Ten long chains saturated and unsaturated fatty acids. The roots of Rubia cordifolia produce two anthraquinones, namely cordifoliol and cordifodiol. On the basis of spectral data analyses and chemical reactions their structures have been established as 1-hydroxy-3-ethyl-9, 10 anthraquinone (1) and 1,8-dihydroxy-11,20 (15pentylnaphthoquinone) phenantherne (2).[26]. The roots of Rubia cordifolia provide several naphthoquinones and hydroxyanthraquinones and their glycosides. Other quinones isolated were 4dihydroxy 2-methylanthraquinone, 4naphthoquinone, lucid primeveroside, 1, 5-dihydroxy 2methyl anthraquinone, 3-prenyl methoxy 1, ruberythric acid anthraquinones, 2-methyl-1, 3, 6-trihydroxy-9, 130
10anthraquinone and 2-methyl-1, 3, 6-trihydroxy-9, 10anthraquinone 3-Oa-hamnosyl (1→2)-β-glucoside. 6Methoxy geniposidic acid (iridoids) is also found along with man Justin, garancin, and alizarin.[28]. The methanol extract of Rubia cordifolia roots contains 2 naphthoquinones.[29]. The bicyclic hexapeptides RA-I and RA-II have been isolated from chloroform/methanol extract of roots of Rubia Cordifolia.[30]. Recently two new bicyclic hexapeptides, allo RA-V and neo-RA-V, and one cyclic hexapeptide, O-Secora-V were isolated from Rubia cordifolia.[31]. The plant also contain dihydromollugin, Mollugin, rubilactone.

Traditional Therapeutic Uses

In ‘Charaka Samhita’ Manjistha is also mentioned in ten varnya drugs and as Visagha.[34] Jvarahara.[35] the powdered dried roots and fruits we can give internally to cure the skin diseases and disorders of spleen.[36] It is also given in major burns, fractures and dysentery[37] to improve complexion and to treat skin diseases and blood born diseases.[38,39] Manjistha paste is used along with honey in Ayurvedic medicine. It has properties of blood purifying agent and pigment stimulant, tonic and are used in skin and blood diseases.[40] Ayurvedic pharmacopoeia of India therapeutically indicate it for Yoni roga (menstrual disorder), Kushta (skin disease), Sarapvisa (snake bite), Visarpa (herpes virus), Aksi roga (eye disease), Arsana (haemorrhoids), Bhagna (Fracture).[41] Formulations containing manjistha as main ingredient used for treating skin disease.[42] The roots are alterative, anodyne, antiphlogistic, astringent, diuretic, expectorant, styptic and vulnerary.

Ayurvedic Preparations

Manjistha is an important element of lots of ayurvedic formulations; Mahamanjisthadi kvatha, Manjisthadi taila, Manjista arka, Manjistha malahara, Manjistha phanta, Septilin syrup etc. Mahamanjisthadi kvatha: The herbal addition used as blood purifier, immunomodulator, promotes skin health and skin texture. Septilin syrup contains many herbal preparation containing Rubia cordifolia as one of the constituent, tried in 40 children suffering from various upper respiratory tract infections. Excellent response was seen in 34 (85%) children.
Incidence of recurrences was minimal\textsuperscript{[54]} Body Revival: It is an Indian herbal formulation having suspension of Aegle marmelos, Acorus calamus, \textit{Rubia cordifolia}, Saussurea lappa, Blumea lacera, Rumex vasicarius, Curcumas melo, Symlocos racemosa and honey. Investigation showed that Body Revival potentiates cardioprotection against isoproterenol induced myocardial ischemia and ADP or collagen induced human platelet aggregation\textsuperscript{[55]}.

**Pharmacological actions**

**Anticarcinogenic activity**

The root extract of \textit{Rubia cordifolia} has potent anticancerous activity against MDA-MB-231 breast cancer cell lines using Sulforhadamine B assay \textsuperscript{[56]}. The administration of Mollugin in Mice showed inhibition of passive cutaneous anaphylaxis and protection of mast cell degranulation and also showed inhibition against lymphoid leukemia (P388) \textsuperscript{[57]}. The ethanolic extract of \textit{Rubia cordifolia} exhibited strong inhibition of human cervical cancer cell line thus can be a source of powerful pharmacophore for treatment of disease like cancer \textsuperscript{[58]}. The presence of cyclic hexapeptides and quinones in \textit{Rubia cordifolia} exhibited a momentous anticancer activity against various proliferating cells \textsuperscript{[59]}. The derivatives of RA-V like Alkyl ether and ester exhibit momentous effects against P388 lymphocytic leukemia, human nasopharynx carcinoma, and MM2 mammary carcinoma cells \textsuperscript{[60]}. Several secondary plant metabolites were isolated from roots of \textit{Rubia cordifolia} and rhizomes of \textit{G. glabra} by using Cayman COX (ovine) inhibitory screening assay, few molecules showed potent COX-2 inhibitory activity against cancer \textsuperscript{[61]}.

**Anti-tumour activity**

Anti-tumour activity of RC-18, proved from \textit{Rubia cordifolia} was repeatedly tested in different sets of experiments on a spectrum of experimental murine tumours, viz. P388, L1210, L5178Y, B16 melanoma, Lewis lung carcinoma and sarcoma-180. RC-18 exhibited significant increase in life span of ascites leukemia P388, L1210, L5178Y and a solid tumour B16 melanoma. However, it failed to show any inhibitory effect on solid tumours, Lewis lung carcinoma and sarcoma -180. Promising results against a spectrum of experimental tumours suggest that RC-18 may lead to the development of a potential anti-cancer representative \textsuperscript{[62]}.

**Wound Healing Effect**

Wound Healing of a herbal formulation of \textit{Rubia cordifolia} was done. emulsion formulation of herbal drug mixture of \textit{R.cordifolia}, \textit{C.asiatica}, \textit{T.belerica}, \textit{P.zeylanica}, and \textit{W.somnifera} was formulated. Animals were inspected daily up to 20 days and healing was good and produces wound contraction, period of epithelization and histological study. It shows, that there is contraction and new epithelization of excision wound \textsuperscript{[63]}.

**Anti-proliferating Property**

Roots of the \textit{Rubia cordifolia} L. Ethyl acetate extract inhibits keratinocyte propagation in vitro and promotes keratinocyte segregation in vivo. Ethanolic extract of Radix Rubiae is fractioned sequentially with hexane, ethyl acetate (EA), n-butanol and water. EA fraction was found to possess most effective antiproliferative action on HaCaT cells (IC (50) 0.9 microg/ml). The standardized EA fraction was formulated into local application like gel form and its keratinocyte-modulating action was tested on mouse tail model. EA fraction dose-dependently increased the number and the kness of granular layer and epidermal thickness on mouse tail skin, indicative of the keratinocyte differentiation-inducing activity. Taking the in vitro and in vivo findings together, the present preclinical study confirms that EA fraction is a promising antipsoriatic agent warranting further development for to treat psoriasis. \textsuperscript{[64]}

**Antibacterial Activity**

The antibacterial activity of the extracts of stem-bark, \textit{Rubia cordifolia} and \textit{Lantana camara} root-bark, prepared with solvents of different polarity, was evaluated by the agar-well diffusion method. Twelve bacteria, six each of gram-positive and gram-negative strains, were used in this study. Chloroform and methanol extracts of \textit{R. cordifolia} and \textit{L. camara} was found to be more particular on the way to the gram-positive strain, although gram-negative \textit{P. aeruginosa} was also inhibited by the methanol extracts of both these plants in a dose dependent manner. \textit{R. cordifolia} was significantly active against \textit{B. subtilis} and \textit{S. aureus} compared with streptomycin and penicillin G used as standards \textsuperscript{[65]}.

Comparative studies of \textit{Rubia cordifolia} and its Commercial Samples were done. It was carried out by comparing the authentic sample from its commercial samples keeping in mind the pharmacopeial standards of Ayurveda. The quantitative phytochemical studies of the drug samples are carried out by study the fraction of ash, extractive values and qualitative screening was carried out by Thin Layer Chromatography and different biochemical tests \textsuperscript{[66]}.

**Anti Ulcer Effect**

The effect of \textit{Rubia cordifolia} against experimentally induced gastric ulcer and compare activity with its fractions by employing aspirin plus pylorus-ligated ulcer screening model in wistar rats. The study confirmed that chloroform extract showed the momentous activity at lower doses compared to parent extract. The mechanism can be attributed to decrease in gastric acid secretory activity along with strengthening of mucosal defensive mechanism by prostaglandin synthesis and antioxidant potential \textsuperscript{[67]}.

**Hepatoprotective Activity**

The hepatoprotective activity of an aqueous and methanol extract of \textit{Rubia cordifolia} was investigated against acetaminophen and CCl4induced hepatic damage. Acetaminophen created 100% death at a dose of 1 g/kg in mice while pretreatment of animals with plant extract (500 mg/kg) reduced the fatality rate to 30%. Acetaminophen at a dose of 640 mg/kg produced liver damage in rats as manifested by the rise in serum levels of GOT and GPT to 1447±182 and 899±201 IU/L (n =10) respectively, compare with respective manage values of 97±10 and 36±11. Pretreatment rats through plant extract (500 mg/kg) lower significantly (p<0.005) the respective serum GOT and GPT levels to 161±48 and 73±29 \textsuperscript{[68]}.
**Anti-acne property**
Methanol extract of *Rubia cordifolia* inhibit proliferation of *P. acne*.[89] It is moderately effective against TNFalpha and show low activity against IL-8. It is regarded as astringent and useful in external inflammations like ulcers and skin diseases.[70] The anthraquinone rich fraction of *R.cordifolia* in a gel formulation showed The anti-acne activity against *Propionibacterium acnes, Staphylococcus epidermidis*, *Malassezia furfur* when compared with standard Clindamycin gel.[71]

**Anti-oxidant activity**
Extract of root of *Rubia cordifolia* and its constituent rubiadin were found antioxidant property.[72],[73],[74] Hydroxanthraquinones were the prime antioxidant phenolic constituents of *R. cordifolia*.[75] The antioxidant properties of *R.cordifolia* extract for protection Alcoholic against lipid peroxidation and reduced glutathione (GSH) content in rat liver homogenate compared with vitamin E and parabenzoquinone (PBQ).[76]

**Anti-microbial activity**
Extract of *R. cordifolia* showed a good inhibitory activity against *P. acnes* standardized culture. The evaluation was carried out by both dilution method as suggested in MIC, there *R. cordifolia* extract was taken 600 µg/ml. The evidence of anti-acne activity of *R.cordifolia* was further supported by Cup-plate method.[77] *Rubia cordifolia* was effective against Klebsiella pneumonia. The root extracts of *R. Cordifolia* had studied for their antimicrobial activity against different pathogenic bacteria. Sitosterol and daucosterol possess antibacterial activity. The root extracts constituents such as anthraquinones and flavonoids suppressed the activity phytosphatogens of Gossypium.[78] Aldehyde aceate, dihydromollugin and rubiamillin reported to have significant antibacterial activity against Klebsiella pneumonia.[79] Ethanolic extract inhibited s-Lactamase producing uropathogenic *E. coli*.[80] The chloroform and methanol extracts reported to have antibacterial activity against the grampositive strains, although gram negative *Pseudomonas aeruginosa* was also inhibited by the methanol extracts in a dose dependent manner. The aqueous extract is active against *Bacillus subtilis and Staphylococcus aureus* compared with streptomycin and penicillin.[81] The ethanolic whole plant extract also showed same result.[82] Rubiacordone A reported to have considerable antimicrobial activity against Gram-positive bacteria like *Bacillus subtilis, Streptococcus faecalis and Bacillus cereus*.[83] The green synthesized silver nanoparticles using *R. cordifolia* plant root extract was highly inhibiting the bacterial pathogens resembling *Plesiomonas shigelloides, Vibrio alginolyticus, Pseudomonas aeruginosa*, *Shigella spp*, and *Vibrio parahaemolyticus*. They had highest antimicrobial effect against *Pseudomonas aeruginosa* and *Plesiomonas shigelloides*. [84]

**Anti-inflammatory activity**
The aqueous extract of *R. cordifolia* showed anti-inflammatory effect in rats.[85] The anti-inflammatory action is because of the presence of rubiamillin. The aqueous extract showed anti-inflammatory activity in rats with carrageenan paw oedema in a dose dependent manner, which is comparable to that of phenylbutazone.[86] It also inhibited the lipoxygenase enzyme pathway, which catalyses the production of various inflammatory mediators such as leukotrienes that are involved in asthma, arthritis, and other inflammatory disorders and the production of cumene hydroperoxides.[87] Notable nitric oxide scavenging activity was exhibited in vitro by some extracts of *R.cordifolia*.[88] A formulation of munjistin and purpurin from cell culture manifested to have and antiproliferative action during the rapid development of a model oedema.[89]

**Radioprotective Property**
Radioprotective latent of alcoholic extract of root of Manjistha showed a significant radiation guard (67%) as assessed by increased animal endurance when *R. cordifolia* extract was administered intra peritoneally before radiation exposure. Results suggest the alcoholic root extract provides protection against radiation-induced lipid peroxidation, hemopoietic injury and genotoxicity.[90]

**Nephrotoxicity**
The hydro-alcoholic extract of *Rubia cordifolia* can reduce the strength of cisplatin induced nephrotoxicity in Swiss albino mice. The extract could significantly decrease the cisplatin induced nephrotoxicity as inferred from the tissue antioxidant status in the drug administered animals. Remarkable change was observed in serum creatinine and urea levels. Lipid peroxidation in the kidney and liver tissues was also considerably reduced in *Rubia cordifolia* extract treated animals.[91] An effective column-switching counter-current chromatography (CCC) protocol combining stepwise elution mode was successfully developed for simultaneous and preparative separation of anti-oxidative components from ethyl acetate extract of traditional Chinese herbal medicine.[92]

**Anti-Protective effect**
The hydro-alcoholic extract of roots of *Rubia cordifolia* Linn. Shows the protective effects (HARC) against ethylene glycol induced urolithiasis and its possible underlying mechanisms using male wistar albino rats. Ethylene glycol feeding resulted in hyperoxaluria, hypocalciuria as well as increased renal excretion of phosphate. The greater than before calcium and oxalate levels and number of calcium oxalate crystals deposit in the kidney tissue of calculogenic rats was considerably reverted by HARC treatment. The HARC supplementation also prevents the hurt of renal functions. The results indicate that the HARC can protect against ethylene glycol induced urolithiasis as it reduced and prevented the growth of urinary stones. Therefore, HARC is supportive to prevent the repetition of the disease as it showed its result on early stages of stone enlargement. The mechanism underlying this effect is mediated possibly through an antioxidant, nephroprotection and its effect on the urinary concentration of stone-forming constituents and risk factors.[85]

The protective effect of *Rubia cordifolia* against lead nitrate-induced immune response impairment and kidney oxidative damage was studied. Seventy-two adult male Swiss albino mice were used for biochemical and immunological studies and were divided into six groups of six mice each. Mice were treated with lead nitrate (40 mg/kg, orally) either alone and or in combination with RC (50 and 100 mg/kg body weight) daily.
for 40 days. Lead nitrate administration induced a significant 
(P<0.001) increase in LPO, whereas a significant (P<0.001) 
depletion of CAT and GSH in renal tissues. In addition, it also 
showed a significant (P<0.001) reduction in macrophage yield, 
viability of macrophage, phagocyte index, serum immunoglobulin level, and PFC in kidney. However, 
combination treatment with RC observed a significant 
(P<0.001) reversal of lead nitrate-induced toxicity on oxidative 
stress and immunological parameters. The lead nitrate-induced 
immunosuppression is due to oxidative stress and RC can 
prevent the same by virtue of its in vivo antioxidant property.[94]

**Anti-Adipogenic Activity:** Anti-adipogenic activity of 2-
carbomethoxy-2, 3-epoxy-3-prenyl-1, 4-naphthoquinone 
(CMEP-NQ) isolated from the roots of *Rubia cordifolia* L., its 
effects on cell viability, apoptosis, and adipogenesis in 3T3-L1 
preadipocytes were investigated.[95]

**Antih-HIV Activity**

Various extracts prepared from medicinal plants, were chosen 
on the basis of similarity of chemical constituents with reported 
anti-HIV compounds or on the origin of their traditional 
convention as immunomodulators. Various extracts had 
prepared via Soxhlet extraction and liquid-liquid partitioning. 
Ninety-two extracts were prepared from 23 plants. Anti-HIV 
activity was measured in a human CD4+ T-cell line, CEM-GFP 
cells infected with HIV-1NL4.3 from the different 8 plants 
Nine extracts was prepared shows significantly reduced viral 
production in CEM-GFP cells infected with HIV-1NL4.3. 
*Aegle marmelos*, *Argemone mexicana*, *Asparagus racemosus*, 
*Colesus forskohlii*, and *Rubia cordifolia* demonstrated 
promising anti-HIV potential.[96]

**Neuroprotective Properties:** *R. cordifolia* has been shown to 
exert cell/neuroprotective properties via preventing the 
depletion and increasing GSH (glutathione) levels by inducing 
GCLC (c-glutamylcysteine ligase) expression, reducing oxidant 
levels by direct scavenging, and decreasing iNOS expression. 
The protective ability may be attributed to the GSH and 
vitamin C content of the herb.[97] Neuroprotective effect of 
*Rubia cordifolia* Linn. was studied on β-amyloid Induced 
cognitive dysfunction in Mice. Ethanolic extract of *Rubia cordifolia* 
administration significantly (P<0.01) reduced the β-
amyloid induced cognitive and memory dysfunction. The 
extact decreases the neurodegeneration and helps in memory 
retention activity. The extract showed significant effects 
(P<0.05) in short term retention and increases long term 
retention of memory in step-down inhibitory avoidance task 
and an increase (P<0.05) in number of head dippings, line 
crossings and rearings in the open field, and the water-maze 
test. The neuroprotective activity of the plant on alzheimer's 
type dementia may be due to inhibition of AChE, MAO, free 
radical scavenging activity.[98]

**Gastrophic activity:** The activity of *Rubia cordifolia* 
against experimentally induced gastric ulcer and compare 
activity with its fractions by employing aspirin plus pylorus-
ligated ulcer screening model in Wistar rats. The study 
confirmed that chloroform fraction showed the significant 
activity at lower doses compared to plant extract. The 
mechanism can be attributed to decrease in gastric acid 
secretary activity along with strengthening of the mucosal 
defensive mechanism by prostaglandin synthesis and 
antioxidant potential. The extract of *Rubia cordifolia* exhibited 
significant protection against gastric ulcers in all the models of 
rats compared to ranitidine. In polyherbal formulations, the 
ulcerogenic effect in rats showed significantly lesser ulcer 
result even at a very high dosage as compared to that of aspirin

**Antimutagenic activity**

Different root extracts of *Rubia cordifolia* and their 
antimutagenic activity was estimated in Ames Histidine 
reversion assay using Salmonella typhimurium against 
mutations induced by direct-acting mutagen 4-nitro-o-
phenylenediamine (NPD) and against S9-dependent mutagen 2-
Aminofluorene (2-AF) in TA98 tester strain of *S.

**Antiviral activity**

The anti-rotaviral effect of *Rubia cordifolia* aerial part (RCAP) 
and its cytotoxicity toward MA-104 cells was evaluated using 
the WST-8 assay. Colloidal gold technique and real time 
polymerase chain reaction (qPCR) assay was use to verify the 
findings of the antiviral assay. Then, 4’,6-diamidino-2-
phenylindole (DAPI) staining method had consequently used to 
explore the mode of death with the cells. It was revealed that 
both the possibility of MA-104 cells and the viral load were 
reduced with increasing concentration of the extract. DAPI 
staining show that virus-induce apoptosis was the cause of the 
low down cell viability and viral load, an outcome which was 
accelerate with incubation in the aqueous herbal extract. 
The major compounds identified to exhibit this activities were 
Xanthopurpurin and Vanillic Acid. This study showed that 
RCAP extract effectively inhibited rotavirus multiplication by 
promoting virus-induced apoptosis in MA-104 cells.[101]

**Diuretic activity**

Hydroalcoholic extract of roots of *Rubia cordifolia* in rats to support 
its folklore claim. Four groups of rats were treated with 
vehicle (normal saline: 25 ml/kg), furosemide (20 mg/kg) and 
two doses of extract (286 mg/kg and 667 mg/kg body weight) 
oraly. Urine excreted was collected up to 5h post-treatment 
and analyzed for urine volume, Na+, K+, Cl- and creatinine 
content. The extract showed a significant (p<0.01) and dose 

37963 | P a g e
dependent increase in urine volume and electrolyte excretion. Both doses of extract showed less influence on creatinine clearance than furosemide. The result indicates that hydroalcoholic extract of roots of *Rubia cordifolia* possesses potent diuretic activity.[102]

**Anti-convulsant Activity:** Triterpenes isolated from *Rubia Cardifolia* inhibited seizures induced by maximum electric shock, electrical kindling and various chemoconvulsants in rats. Brain GABA and serotonin (5-HT) contents were raised by triterpenes reveals its anticonvulsant property.[103]

**Immunity enhancing activity:** The ethanolic extracts of the whole plant of *Rubia Cardifolia* were tested for many immunity enhancing activity using a murine model. The active compound present in the extract enhanced both cell-mediated and humoral immunity. Administering the extracts to rats that were given the immunosuppressive drug, phosphamidon showed significant restoration in immunity.[104]

**Anti-ESBL (Extended Spectrum β-Lactamase) activity:** The study attempted to explore the antibacterial properties of *Rubia cordifolia*, against ESBL (Extended Spectrum β-Lactamase) producing urinary E.coli. Different E.coli strains were isolated from urine samples collected from patients using standard methods. All the isolates were tested for different antibiotics and screened for their ESBL production based on NCCLS guidelines. Total 7 different ESBL producing E.coli were obtained. All the seven isolates were tested against the ethanolic extract of *Rubia cordifolia* using Kirby Bauer method and were found to be inhibited variably by the extract. Thus suggests inhibitory properties of the extract against ESBL producing E.coli.[105]

**Nootropic and Anti-stress activity:** The Alcoholic extract of roots of *Rubia cordifolia* enhance brain γ-amino-n-butyric acid (GABA) levels and decreased brain dopamine and plasma corticosterone levels. Acidity and Ulcers caused due to the cold restraint stress were inhibited by the alcoholic extract. Animals treated with alcoholic extract spent more time in open arm in elevated plus maze model, which antagonized scopolamine-induced learning and memory mutilation.[106]

**Cardioprotective activity:** Nowadays combination therapy (hypolipidemic, diuretic, calcium channel blocker, vasodilator, antiplatelet) are common in patients with cardiac dysfunction. Chances of drug interaction and adverse consequences arise with combination therapy. *Rubia cordifolia* an individual plant with multiple activities is essential to support heart health.[107]

**Anti-arhritic activity**

The ethanolic extract of *Rubia cordifolia* exhibits a significant anti-arhritic activity which was statistically similar to aspirin.[108]

**Spasmolytic activity**

The Crude extract of *Rubia cordifolia* suppressed the spontaneous contractions of guinea-pig atria, rabbit jejunum and rat uterus in a concentration dependent manner (0.1-3 mg/ml). In rabbit aorta, it inhibited 136 norepinephrine (10 µM) and KCl (80 mM) induced contractions. Replacement of physiological salt solution with calcium free solution abolished the spontaneous movements of rabbit jejunum. However, the addition of calcium (25 pg/ml) in the tissue bath restored the spontaneous movements. When the tissues were pretreated with plant extract (1 mg/mi) or verapamil (0.5 µg/ml) addition of calcium failed to restore spontaneous contractions. These results Indicate that the plant extract exhibits spasmyolytic activity similar to that of verapamil suggestive of the presence of calcium channel blocker like constituent(s) in this plant.[109]

**Sexual Performance and Virility activity**

A number of herbal drugs including *Rubia cardifolia* have been validated for their effect on sexual behavior and fertility and can, therefore, serve as the basis for the identification of new chemical leads useful in sexual and erectile dysfunction.[110]

**Anti-peroxidative activity**

Solvent free alcoholic extract of *R. cordifolia* showedantiperoxidative property in rat liver homogenate. The cumene hydroperoxide induced malondialdehyde formation accompanied by the reduced glutathione level even in the presence of above toxin.[111]

**Anti-platelet activating effect**

In Ayurveda herb is prescribed to cure blood related component. Partially purified fraction of the whole plant inhibits the action of platelet activating factor at its receptor level either by its blocking or desensitization property.[112]

**Other relevant uses**

Separately from its medicinal value, this plant can also used as a natural colourants in food, syrups, medicated oils, etc… Root derived dye also used as cloth and hair dye. Madder extracts is commonly used as a colorant for confections and soft drinks, because of its advantageous resistance to heat and light. The convincing antioxidant activity of madder is successfully exploited in food business as chemo-preventive agents. *R. cordifolia* can be used as a single drug to cure Chikungunya fever.[113] Leaf extract is used during cataract of eyes, conjunctivitis and also to clean the eyes. In patients with eczema, the topical application of the plant caused reduction in the severity of score and oedema, exudation and itching being significantly relieved. Crude methanolic extract suppressed the spontaneous contractions of guinea-pig atria, rabbit jejunum and rat uterus in a concentration dependent manner. The indicate spasmylytic activity analogous to verapamil, a criterion Ca++ channel blocker, suggest the attendance of calcium channel similar to constituent in the plant, that may be liable for the folkloric use of this plant for disintegration of urinary stones.[114] 4DNA Topoisomerases I and II Inhibition by the constituents from the roots of *R. cordifolia* were established.[115] Psoriasis is a skin disease associated with hyper proliferation and aberrant differentiation of keratinocytes. The *in vitro* and *in vivo* findings together, the preclinical study confirms that ethanol fraction is a promising antipsoriatic agent.[116] It can protect indomethacin-induced enterocolitis in rats and may be beneficial in patients with inflammatory bowel diseases.[117] Wool dyed with extracts from madder also showed improved insect resistance for carpet beetle.[118]

**CONCLUSION**

Manjishtha is a widely and traditionally used medicinal plant amongst all the thousands of medicinal herbs. It plays an important role as a potent blood purifier, anti-oxidant, anti-
inflammatory, anti-stress, anti-microbial which helps to cure acne and improve skin health. The pharmacological activities reported in the present review validate the great therapeutic value of Manjishtha. It is an important source of chemical compounds such as anthraquinones, glycosides, saponins, steroids, phenols, flavonoids, alkaloids, tannins etc. These compounds are accountable for various pharmacological activities like anti-carcinogenic, anti-acne, immunity-enhancing, anti-oxidant, anti-inflammatory, cardio-protective, gastro-protective, hepato-protective, neuro-protective, nephro-protective etc. The plant has a numerous traditional uses for ameliorating variety of diseases, which were additionally supported by quite a lot of pharmacological and clinical studies detailing the definite bioactivity of extracts of the plant. Accordingly Manjishtha 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.

References

12. Dr. Krishnachandra chunekar edited by Dr. Gangasahay pandey Bhayprakash nighantu of shri Bhavmishra,with Hindi commentary chaukhamba bharti academy 2004 pg 110


37967 | Page
How to cite this article:
Dr. Bharti Sadabal, Dr. T.A.Pansare, and Dr Sachin Govindrao Tike. 2020, A Comprehensive Review on Manjishtha (Rubia Cordifolia L.) with Special Reference to Ayurvedic and Modern Aspect. Int J Recent Sci Res. 11(04), pp. 37958-37968. DOI: http://dx.doi.org/10.24327/ijrsrc.2020.1104.5214

********

International Journal of Recent Scientific Research Vol. 11, Issue, 04 (A), pp. 37958-37968, April, 2020