



RUBIA CORDIFOLIA AND TINOSPORA CORDIFOLIA: A MAGIC REMEDY FOR INFLAMMATION

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ABSTRACT

Inflammation is the normal response of all living tissue to an injury. When a harmful stimuli such as pathogen, irritants or damaged cells attack the healthy viable tissue, it fight against the stimuli in the form of inflammation. Therefore it can be called as normal biological response. Otherwise the inflammation can be considered as the essential stage of healing and repairing. The ultimate goal of inflammation is to replace the injured tissue. Herbs were used for the therapeutic purpose for decades in one form or another in the indigenous system of medicine such as Ayurveda, Siddha and Unani. India has a treasure of medicinal plants. These plants are rich sources of various bioactive principles such as alkaloids, glycosides, tannins, flavonoids, phenols, terpenoids etc. All parts of these medicinal plants are reported to posses a wide variety of ethanobotanical and pharmacological activities. Therefore they become valuable for the management of various life threatening ailments. The use of herbs as the key ingredient for the production of drugs is getting better acceptance nowadays since they have less side effects and adverse reactions as compared to synthetic medicine. They are cost effective and easily available when considering the ordinary people. This review article mainly focus to study the phytochemical constituents and ethanomedical uses two important plants Rubia cordifolia and Tinospora cordifolia which have well established anti inflammatory activity according to the traditional system of medicine.

KEYWORDS: Inflammation, Rubia cordifolia, Tinospora cordifolia.

INTRODUCTION

Inflammation,^[1] is the normal response of all living tissue to an injury. When a harmful stimuli such as pathogen, irritants or damaged cells attack the healthy viable tissue, it fight against the stimuli in the form of inflammation. The acute inflammation is considered as the first line of defense by the host against the foreign body or the injury. Inflammation is initiated within minutes through the activation of immune cells such as macrophages, mast cells, neutrophils and lymphocytes. Inflammation is a major health issue since ancient times mainly affecting the older population. Joints are more prone to inflammation. There are five cardinal signs of inflammation such as; dolor (pain), calor (heat), rubor (redness), tumor (swelling), function laesa (loss of function). The underlying factors that results in the onset of inflammation include burns, chemical irritants, toxins, trauma etc.

Rubia cordifolia and *Tinospora cordifolia* are the two traditional herbs with intense anti-inflammatory activity. The phytochemical screening, ethanomedical uses and various pharmacological activities, particular focus on the anti-inflammatory activity of the two plants *Rubia cordifolia* and *Tinospora cordifolia* are considered in this

review article. This work aims to establish the relationship between the various phyto constituents and the various pharmacological activities.

1. *Rubia cordifolia*



Figure 1: *Rubia cordifolia* plant.



Figure 2: *Rubia cordifolia* roots.

Rubia cordifolia is an outstanding herb used for years in the Unani system of medicine. It is a thorny creeper or climbing scrambling perennial herb. The characteristic feature of Rubia is the strong red rhizomatous base and roots, usually 10 m long. It is very common in high altitudes of India ranging from Northwest Himalaya eastwards and southwards to Ceylon and Malacca and Northeast Asia from Dauria (East Siberia) to Japan, Java and tropical Africa. The traditional ayurvedic formulations such as aswagandharistam, gulguluthiktharishtam, jaatyaadi ghrita, madhookasavam, majishtaadi taila, useerasavam etc. make use of manjishta as a major constituent. The miraculous benefits of manjishta in conditions such as skin disease, spleen disorder, burns, bone fracture, dysentery etc. is well explained in the Charakasamhitaa and sushruta samhitaa.^[2,3]

Morphology

- Flowers:** Flowers are very small, greenish white in color, arranged in branched clusters called dichasial cyme (forked flowering stalk which bears specific number of flowers in each branch).
- Stem:** Stem is slender, quadrangular, divaricately branched, glabrous or prickly-hispid, especially on the angles.
- Root:** *Rubia cordifolia* has long, cylindrical, flexuous, smooth and reddish roots.
- Leaves:** Leaves are 3.8-9 X 1.6-3.5 cm in size. Arranged in a whorl of four, cordate-applaud to ovate lanceolate, 3-9 palmately veined, upper surface for the most part glabrous and harsh. Lower leaves are bigger than the upper, and all are scabrous above. Leaf base is somewhat cordate. The edges are with minute white prickles. leaves are oval to heart shaped.
- Fruit:** Round fleshy drupe, when ripe it is dark purple.

Table 1: Plant hierarchy.

Kingdom	Plantae
Division	Tracheophyta
Subdivision	Angiosperms
Class	Dicotyledneae
Subclass	Sympetalae
Order	Rubiales
Family	Rubiaceae
Genus	Rubia
Species	Cordifolia

Table 2: Vernacular names.

Language	Name
Hindi	Majith
Sanskrit	Aruna, bhandi, bhandiralatik
Malayalam	Man-chetti
Kannada	Chitravalli, manjishta
Tamil	Manjitti, ceevalli
Telugu	Chiaranjil, manderti, tamravalli
Assamme	Mandar, majathi

Table 3: Organoleptic property.

Colour	Reddish
Odour	Characteristic
Taste	Sweet, bitter, achrid

Ethanomedical review^[4,5]

Rubia cordifolia commonly known as Indian madder is a valuable medicinal herb. The red rhizomatous root of Indian madder forms an essential raw drug for many ayurvedic formulations as it has many potent pharmacological properties. Studies revealed the antioxidant and lipid peroxidation inhibitory activity of *Rubia cordifolia*, which explores its therapeutic potential in acute inflammation.

It is well known for blood purifying property and it is useful in curing many skin diseases such as acne, scabies, eczema and other allergic conditions. Manjishta is beneficial in many gastrointestinal ailments such as loss of appetite, digestant, dyspepsia and in the case of worm infestation it act as an vermicide. It can calm down the nervous stimulation and thus found effective in the management of epilepsy.

In Ayurveda the various dosage forms of manjishta such as decoction, triphala etc were used as a remedy for gouty inflammation and it is diuretic which can reduce the edema associated with inflammation.

When it is given internally it can be used in the treatment of uterine bleeding, haemorrhage, bronchitis and stones in the kidney and gallbladder.

In the Chinese traditional medicine the roots of *Rubia* were traditionally used for the treatment of cancer tuberculosis, rheumatism, hematemesis, metrorrhagia and menoxenia.

Phytochemical review^[6,7,8,9,10]

The roots of *Rubia cordifolia* contain many phytochemical principles such as anthraquinone, iridoids, hexapeptides, rubiprasins, quinones and triterpenoids. Anthraquinones are the major active principle having biological activity. The predominant anthraquinones present are alizarin (1, 2-dihydroanthraquinone), purpurin (trihydroanthraquinone) and munjistin (xanthopurpurin-2-carboxylic acid). Cordifoliol and cordifodiol are the two new anthraquinones isolated from the roots which are pharmacologically active. Rubiadin is a major active constituent isolated from *Rubia cordifolia* Linn which shows hepatoprotective effects. The anthraquinone precursor 1,4-dihydroxy-2-naphthoic acid (DHNA) is one of the constituent of manjishta with anti psoriatic effects. Rubiasin A-C are the three anthracene derivatives isolated from the rubia plant. Hydroxyanthraquinones are the phenolic constituents of the roots of *Rubia cordifolia*. Mollugin is one of the anti-inflammatory principle present in the plant.

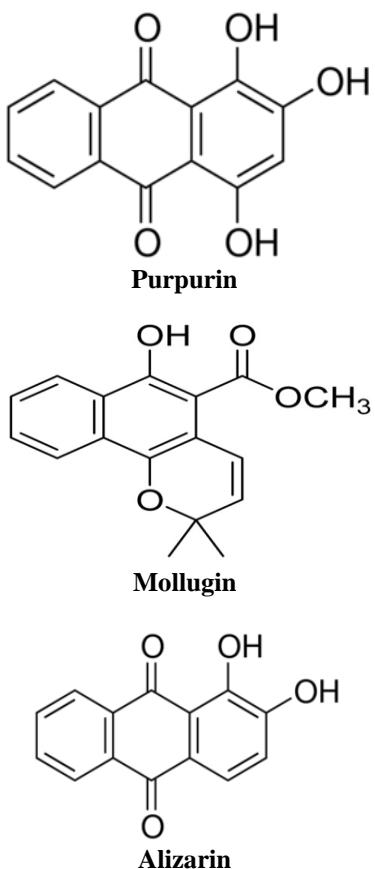


Figure 3: major chemical constituents of *Rubia cordifolia*.

Anti-inflammatory activity of *Rubia cordifolia*^[4,5]

Rubia cordifolia shows significant anti-inflammatory activity. 1-hydroxytectoquinone is the active principle in manjishta showing anti-inflammatory activity. The phenolic constituent in *Rubia cordifolia* hydroxyanthraquinones and mollugin shows strong antioxidant action and blocks the mechanism of inflammation by the inhibitory effect on lipid

peroxidation and by nitric oxide scavenging potential. The free radical NO will be formed during the mechanism of acute inflammation. Therefore the antioxidative potential and the anti-inflammatory activity of the plant constituents are directly related. The Rubia terpenes and Rubia cyclopétides such as rubianol C, rubiabonols A&F and rubiarbonone C shows inhibitory activity on NO production thus fastens the anti-inflammatory pathways.

2. *Tinospora cordifolia*



Figure 4: Leaves of *Tinospora cordifolia*.

The plant is circled all through the tropical region of India up to 1,200 m above sea level from Kumaon to Assam, in north extending through West Bengal, Bihar, Deccan, Konkan, Karnataka and Kerala. It is a truly fundamental plant of deciduous and dry timberlands, creating over wall and little trees.

Morphology^[11,12]

- Leaves:** Simple, alternate, exstipulate, long petioles up to 15 cm long, roundish, pulvinate, both at the base and apex with the basal one longer and twisted partially and half way around. Lamina broadly ovate or ovate cordate, 10–20 cm long or 8–15 cm broad, 7 nerved and deeply cordate at base, membranous, pubescent above, whitish tomentose with a prominent reticulum beneath.
- Flowers:** Unisexual, small on separate plants and appearing when plant is leafless, greenish yellow on axillary and terminal racemes. Male blooms are grouped, female generally single. Sepals 6, free in two series of three each, the external ones are littler than the inward. Petals 6 free smaller than sepals, obovate and membranous.
- Fruits:** Aggregate of 1-3, ovoid smooth drupelets on thick stalk with sub terminal style scars, scarlet or orange coloured. Fruits are pea shaped, fleshy and shiny.
- Stem:** Succulent, having long filliform fleshy aerial roots arising from the branches.
- Bark:** Thin, grayish or creamy white in colour, when peeled fleshy stem is exposed.

Table 4: Plant hierarchy.

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnolipsida
Subclass	Ranuculidae
Order	Ranuculidae
Family	Menispermaceae
Genus	<i>Tinospora</i>
Species	<i>cordifolia</i>

Table 5: Vernacular names.^[12,13]

Language	Name
Hindi	Geloy, gulancha, gulbel, gurcha, jivantika
Sanskrit	Guduchi, amrita, amritavalli, amritavallari
Malayalam	Chittamruthu
Kannada	Amrutha balli, agniballi
Tamil	Shindilakodi
Telugu	Tippa-teega
Punjabi	Batindu, graham, garum
Bengali	Gulancha
Marathi	Gulvel
Gujarati	Garo, galac, galo, gadu-na-vel
Assamese	Seendal, siddhilata, amarlata
Manipuri	Ningthou, khongli

Table 6: organoleptic properties of *Tinospora cordifolia* leaf powder.

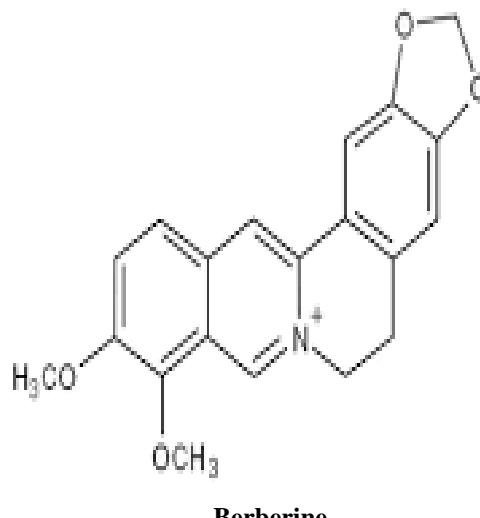
Colour	Green
Odour	Characteristic
Taste	Bitter

Ethanomedical review^[14,16,16,17]

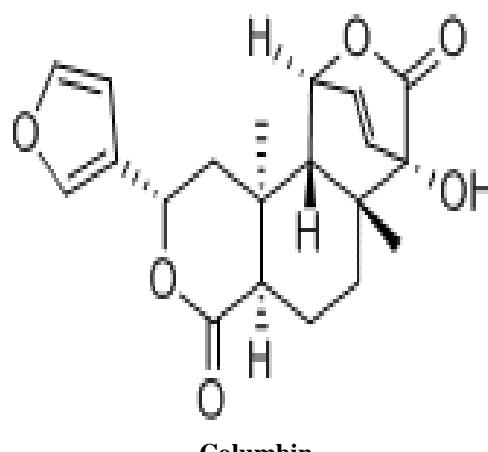
Tinospora cordifolia also called guduchi, the whole plant posses diverse health benefits and used since ancient times in the traditional system of medicine. The recent scientific researches has explored the antipyretic, anti-inflammatory antioxidant, antispasmodic, anti allergic, anti-rheumatic, anti leprotic, anti stress, hypoglycemic, hepatoprotective, immunomodulatory and anti cancerous activities of *Tinospora cordifolia*. It has the therapeutic potential to detoxify and cleanse the whole body system by having direct action through liver. Guduchi is commonly used as anti-microbial, anti fungal, analgesic and also used for the treatment of jaundice, skin diseases and anemia. It is quite effective in gastro intestinal disorders like dyspepsia and gastritis. The traditional medicinal system of Thailand utilized *Tinospora cordifolia* for the management of diarrhea, which has been reported to inhibit the in vitro growth of intestinal protozoan parasite *Blastocystis hominis*. Shade-dried-leaves are ground into powder and mixed with hot water and the mixture is taken orally in the treatment of diabetes by the people living in sacred-groves in Cuddalore district of Tamilnadu, India. The leaf and root parts are used by many village-folks for its aphrodisiac action.

Phytochemical review^[18,19,20]

Bioactive compounds such as glycoside, alkaloid such as berberine, choline, palmatine, tinosporin, isocolumbin magnoflorine, tembetarine and tetrahydropalmatine, fatty alcohol, bitter glucoside giloin and non glucosidic bitter principle gilonin in the *Tinospora cordifolia* leaf and stem are responsible for its pharmacological activities. Diterpenoid lactones such as furanolactone, tinosporin, tinosporide, jeteorine, columbin and clerodane derivatives, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides are also found in this plants. The guduchi leaves are rich in protein and calcium phosphorous. The methanol, ethanol and water extract of *Tinospora cordifolia* posses active constituents such as polyphenols, flavonoids and tannins which contribute to the strong free radical scavenging activity. This can be correlated to the anti inflammatory and anti arthritic activity of *Tinospora* as the free radicals are involved in the process of inflammation. Glycoside such as furanoid diterpene glycoside, tinocordiside, tinocordifolioside, cordioside, cordifolioside A and B, syringing, syringing-apiosylglycoside and palmatoside C and F are found in the stem of the plant.



Berberine



Columbin

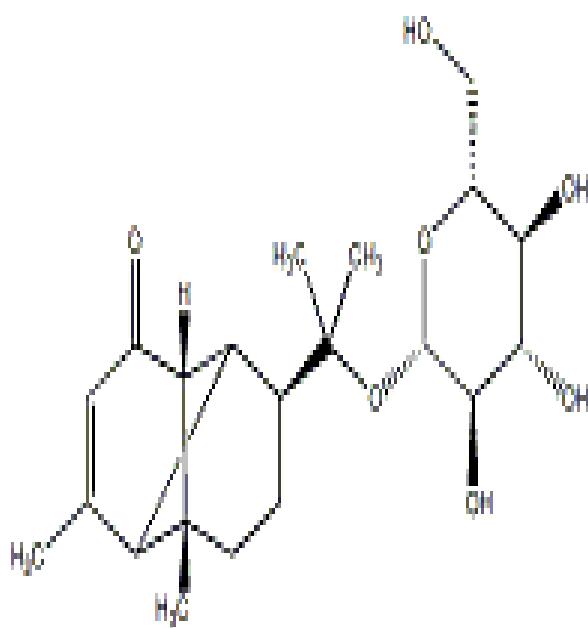


Figure 5: Major Chemical Constituents of *Tinospora cordifolia*.

Anti-inflammatory activity of *Tinospora cordifolia*^[16,17,20,21]

Diterpenoid lactones present in the leaf and stem extract of *Tinospora cordifolia* is responsible for the anti inflammatory activity. The flavonoids and diterpenoid lactones in the hydro alcoholic extract of *Tinospora cordifolia* leaves are shown to exhibit phagocytic activity on polymorphonuclear cells which are elevated in the condition of inflammation, thereby reduces inflammation. Cordifolioside A, magnoflorine, tinocordiside and syringin have been reported to potentiate the phagocytic activity of macrophages and thereby reducing inflammation. The aqueous extract contain alkaloids, di terpenoid lactones, glycosides, steroids, sesquiterpenoids and phenolic constituents which have been reported to activate cytotoxic T cells and B cells and also results in up regulation of IL-6 cytokine, ultimately all these contribute to the anti-inflammatory activity. These constituents actually antagonize the various autocoid involved in the pathophysiology of inflammation.

CONCLUSION

Inflammation is a major problem since ancient times. Inflammation can occur as a result of many allergens, chemicals and many diseases. It can affect any age group of people and it can affect any part of the body. Herbs are the most suitable choice of treatment option for inflammation. Among them *Rubia cordifolia* and *Tinospora cordifolia* are plants with two potent anti-inflammatory activity which is revealed through the phytochemical review and ethano medical review.

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