Review Article

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A PHYTOPHARMACOLOGICAL REVIEW OF *CORALLARIA PARVIFOLIA* LINN.

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ABSTRACT

Corallaria parvifolia is a medium-sized deciduous tree up to 15 m high and is native to India and Malaysia. It is a well-known plant used in traditional medicine for its broad therapeutical activities. These uses motivated several researchers and scholars to study its chemical composition and pharmacological activities, mainly in seeds, leaves and barks. It has been planted extensively throughout the tropics as an ornamental and has become naturalised in many countries. The phytochemical screening revealed various secondary metabolites such as alkaloids, anthraquinones, tannins, flavonoids, steroids, coumarins, triterpenoids, polyphenols, saponins, polysaccharides and glycosides. Similarly, experimental studies of this plant have shown numerous pharmacological activities such as anti-inflammatory, antinociceptive, antiherpetic, antiemetic, antidiarrheal, anthelmintic, antihypertensive, antifungal, CNS depressant and anticonvulsant and proteinase inhibitor. This review summarises the stupendous therapeutic potential of *Corallaria parvifolia* that should be explored, opening new perspectives and approaches for future researchers and developing new products. This review will satisfy the needs of researchers for their future research activities.

Keywords: *Corallaria parvifolia*, traditional medicine, chemical composition, phytochemistry, secondary metabolites, pharmacological activities.

INTRODUCTION

Corallaria parvifolia belongs to the family Leguminosae. *C. parvifolia,* commonly known as coral wood, heartwood, redwood, crab's eye etc. [1] The tree is propagated from seeds and transplants reasonably well, but germination is slow because of the hard seed coat. It can also be grown from cuttings. It thrives on a variety of soils. The tree is suitable for coastal areas, and in the southern parts of the country, it is planted along roadsides and avenues. The tree excludes gum, known as *madatia.*

The *Corallaria parvifolia* has been reported to demonstrate anti-inflammatory, antinociceptive, antiherpetic, antiemetic, antidiarrheal, anthelmintic, antihypertensive, antifungal, CNS depressant and anticonvulsant and proteinase inhibitor.

Vernacular Names

English: Coral wood, red bead tree, red wood, crab's eye
Hindi: Barigumchi
Tamil: Anaikundumani, anegundumani
Bengali: Rakta kambal
Gujarat: Badigumchi, hati-gumchi
Kannada: Manjodi, manjetti
Malayalam: Manjadi, manjeti
Sanskrit: Kunchandana, Kamboji
Telugu: Bandi guruvenda, bandi gurvina, gurivenda[2,4]

Taxonomy

Kingdom: Plantae
Subkingdom: Viridiplantae
Infrakingdom: Streptophyta
Super division: Embryophyta
Division: Tracheophyta
Subdivision: Spermatophytina
Class: Magnoliopsida
Superorder: Rosanae
Order: Fabales
Family: Fabaceae
Genus: *Corallaria*
Species: *parvifolia* [3]

Distribution

A deciduous, spreading tree belongs to tropical Asia. It is an indigenous species in Malaysia and India. It is found in the sub-Himalayan tract, ascending to an altitude of 1200 m in Sikkim, West Bengal, Assam, Meghalaya, Gujarat, South India and the Andamans.[4] It is profusely found in Western and Eastern Africa, Pacific Island and the Caribbean regions.[5]

Description

Tree: It is an altitudinous evanescent tree, generally erect, having dark brown to greyish bark, and the tree crown is uneven and rounded. The height ranges from 6-15 m with a diameter of up to 45 cm, depending upon the position.[2]

Bark: The bark is dark brown or greyish brown on the external face and greyish white on the inner face, smooth and has numerous crevices, slightly shelling to flaking.[6]

Wood: The wood is hard and used for construction, cabinetwork-timber and firewood.[2]

Leaves: Leaves are bipinnately composite with 2-6 dyads of secondary stalks. Each secondary stalk has 4-9 dyads of leaflets. The leaflet is pale green, thin, oval, and oblong with an

asymmetric base and a blunt apex. The upper face of the leaflet is smooth while the underpart is covered with appressed fine hairs. The leaves turn yellow with age.[6,7]

Seeds: The seeds are grabby, candescent and scarlet red. These seeds are lens-shaped, 7.5-9 mm in diameter and cling to the pods. The seed casing is tough and thick with a bitter taste and foetid odour.[6,8]

Pods: The pods are curved, leathery, long and narrow, with slight constrictions between seeds.[6] These seeds twist and open, revealing 8-12 showy scarlet seeds. The ripened pods remain on the tree for extended periods.

Flowers: Flowers are small and strongly aromatised. They are white to yellow and turn dark yellow after anthesis. Flowers occur in a raceme, and the raceme is 12-30 cm long.[6,8]

Ethno-Medicinal Uses

Whole plant: Asthma, bronchitis, epilepsy, skin diseases, etc.
Stem: Cough, cold, toothache, etc.
Leaves and Bark: Rheumatism.
Seeds: Dysmenorrhea, Abortifacient. [9]

Phytochemistry

Leaves: Stigmasterol, Stigmasterol glucoside, β-Sitosterol, b-Sitosterol glucoside, Aridanin, 3-[(2-acetamido-2-deoxy-β-glucopyranosyl)-oxy]-16α-hydroxyolean-12-en-28-oic acid, Squalene, Apigenin, Isoliquiritigenin, Quercetin 3-O-α-dirhamnopyranosyl-(1'''→2",1''''→6")-β-glucopyranoside-4'-methoxy, Kaempferol-3-O-α-dirhamnpopyrosyl-(1''''→2''',1''''→6''')-β-glucopyranoside, Kaemferol-3-O-α-rhamnopyranosyl(1''''→2''')-β-glucopyranoside, Quercetin-3-O-rhamnopyrosoyl(1'''→4")-)-β-glucopyranoside, Quercetin-3-O-β-glucopyranoside-4'-O-rhamnopyroside, Quercetin-3-O-rhamnospyranosyl(1'''→2")-β-glucopyranoside, Quercetin, kaempferol, Hentriacontane, Nanocosane, Quercetin-3-O-β-glucopyranoside, Dulcitol, Octacosanol, n-Tricosanol, PARVONIN, Ethyl-palmitate, α-D-Glucopyrasonyl-(2→1')-α-D-glucopyranosyl-(6'→2'2)-α-D-glucopyranosyl(6'→1',2→2)-α-D-glucopyranoside.

Bark: 2-Hydroxy-1,2-diphenyl ethanone (benzoin), 18-(2, 3dihydroxyphenyl) nonadec-17-en-2-ol, Ethyl 3, 3-dimethyl-13-hydroxytridecanoate, 3Ethynyl, 5(2, 3-dehydropyrrole) pyridine, Chalcone, Butein, 3-O-β-D-Glucopyranosyl-7-Omethyl catechin, 7-Methoxycatechin, 3-O-D-glucopyranosyl-21-methylcarboxy-olean-12-en28-oic-acid**,** 3-O-β-D-glucopyranosyl-21-methyl carboxy-olean-18-en-28-oicacid, 3-[(2'acetamido-2'-deoxy-β-D-glucopyranosyl)oxy]-16-α-hydroxyolean-12-en-28-oic acid, Robinetin, Ampelopsin, Stigmasta-5, 22-dien-3-ol, 6-Hydroxy stigmast-20(21)-en-3-one**,**Stigmast–5(6), 20(21)-diene-3-one.

Stem: Sucrose, Pinitol, Apigenin

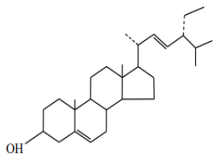
Wood: Robinetin, Ampelosin, Chalcone

Seed: Stigmasterol, Stigmasterol glucoside, Isovitixin, 2,4,7-Trihydroxy isoflavone, Lignoceric acid, O- Acetyl ethanolamine. The seed and its pod contain steroids, saponin, and glycoside.

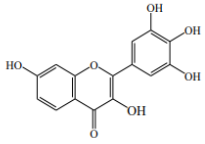
Seed kernel: Dulcitol, Stigmasterol, Stigmasterol glucoside, β-Sitosterol, β-Sitosterol glucoside, α-Spina sterol glucoside.

Aerial parts: Isovitixin, Methyl gallate, Isoschaftoside**,** parvonin**,** Quercetin 3-*O*-(*α*L-rhamnopyranosyl-(1→2)-*β*-D xylopyranoside, Quercetin-3-*O*-[*α*-L-rhamnopyranosyl-(1→2)]-[*α*-L-rhamnopyranosyl-(1→6)]-*β*-D-galactopyranoside,Tamarixetin3-*O*-(*α*-Lrhamnopyranosyl)-(1→2)-*β*-D- galactopyranoside , Quercetrin-3-O-α-L-rhamnopyranoside. [10]

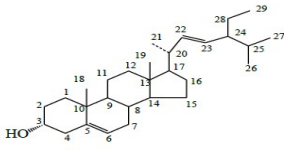
Structure



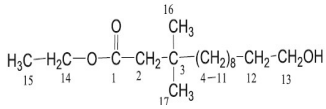
Stigmasterol



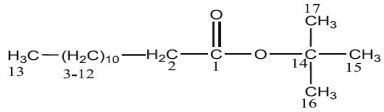
Robinetin



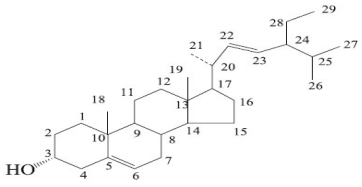
Stigmasta-5,22-dien-3-□-ol



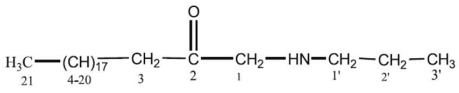
Ethyl 3,3 -dimethyl -13 -hydroxytridecanoate



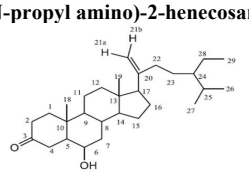
Tert butyl tridecanoate



Stigmasta-5,22-dien-3-ol



1-(N-propyl amino)-2-henecosanone



6-a -hydroxy stigmast -20(21)-en-3-one [11,12]

Pharmacological Studies

Anti-inflammatory
Anti-inflammatory studies were demonstrated from the ethanolic extracts of leaves of *Corallaria parvifolia* in ingrained adult Wistar rats (150-200 g) at doses of 250 and 500 mg/kg. The doses were set up to have inhibitory effects on the acute phase of inflammation, as seen in carrageenan-induced hind paw oedema in rats and a sub-acute study of cotton pellet-induced granuloma formation. The anti-inflammatory activity produced by the leaf extracts may be due to the influence of the active constitutions similar to beta-sitosterol and stigmasterol. Acute toxicity studies revealed that the extract is nontoxic, up to 500 mg/kg, demonstrating the safety profile of the extract. [13,14]

Antinociceptive
Ethanolic extract of leaves of *Corallaria parvifolia* was estimated for antinociceptive activity using different nociceptive models induced thermally or chemically in mice, including hot plate and tail immersion test, glutamate and formalin-induced licking and acetic acid-induced writhing tests at the doses of 50, 100, and 200 mg/kg body weight. In addition, to assess the possible mechanisms, the involvement of the opioid system was indicated using naloxone (2 mg/kg) and cyclic guanosine monophosphate (cGMP) signalling pathway by methylene blue (MB; 20 mg/kg). The results have demonstrated that the extract produced a significant and dose-dependent increment in the hot plate quiescence and tail time. It also independently reduced the number of abdominal constrictions and paw lickings induced by acetic acid and glutamate. The extract of leaves inhibited the nociceptive responses in both phases of the formalin test. Besides, the reversal effects of naloxone indicated the association of opioid receptors on the exertion of ethanolic extract of *Corallaria parvifolia* action centrally. Also, improving writhing inhibitory activity by methylene blue suggests the possible involvement of the cGMP pathway. These results prove the antinociceptive activity of the leaves of *Corallaria parvifolia*. [5,15]

Antiherpetic
Sulfated polysaccharides have been reported as potent impediments to the virus. They present a high density of negative charge that mimics the cell receptor heparan sulfate (HS) interacting with the positively charged viral glycoproteins and blocking the attachment of the virus to the cell. The sulfated polysaccharide of *Corallaria parvifolia* (SP *Cp*) was evaluated for its antiherpetic effect against acyclovir-resistant (AR-29) and sensitive (KOS) herpes simplex virus strains was carried out. The 50% cytotoxic concentration (CC50) was determined by the MTT method, and the 50% inhibitory concentration (IC50) was evaluated by plaque reduction assay. The *in vivo* antiherpetic activity was performed in Male Balb/c mice infected by skin scarification and treated with topical 0.5% (w/w) SP *Cp* formulations. Our results demonstrated that mice treated with SP *Cp* presented a delay in the development and progression of skin lesions compared with the control group. [16]

Antiemetic activity
The antiemetic activity of the crude methanol extract of the leaves of *Corallaria parvifolia* was assessed in male chicks. Copper sulphate 50 mg/kg body weight (p.o.) was used to induce the emesis. The antiemetic activity was ascertained by calculating the mean decrease in retching compared to the control. The extract (150 mg/kg body weight orally) showed an antiemetic activity of 50.17% compared with standard chlorpromazine at the same dose. [17,18]

Antidiarrheal activity
Antidiarrheal activity of the methanolic extract of *Corallaria parvifolia* bark was screened in diarrheal-induced animal models for antidiarrheal potency. The study demonstrated that the methanolic bark extract had significantly reduced the aggregate of wet-faecal mass in dose-dependent activity. [19]

Anthelmintic activity
Ethanolic extracts from the bark of *Corallaria parvifolia* for anthelmintic activity were assessed against *Pheretima posthuma* and *Ascaridia galli*. Thus, a bioassay was developed to measure the time of paralysis and time of death of the worms in concentrations of 25, 50, and 100 mg/mL of the ethanolic extract and compared to piperazine citrate as a positive control. The observed results demonstrated that the ethanolic extract caused paralysis and death of worms when it is in a comparable time to piperazine citrate, especially at a higher concentration of 100 mg/ml. Dash *et al*. (2010) believed that the phenolic compounds in the *Corallaria parvifolia* bark extracts could be responsible for the compromise of the energy generation in the parasites by uncoupling oxidative phosphorylation, which might have paralysed and causally led to the death of both worm species. [20,21]

Antihypertensive
Antihypertensive activity of the *Corallaria parvifolia* seed extract on the blood pressure of normotensive rats was assessed. Animals were treated with methanolic seed extract at doses of 50, 100, and 200 mg/kg body weight. The study showed that *Corallaria parvifolia* seed extract has an antihypertensive effect by decreasing blood pressure in normotensive rats. [22]

Antifungal activity
To inhibit the growth of the pathogenic fungi, the peptides of *Corallaria parvifolia* seeds were efficiently used. These peptides were extracted and fractionated by DEAE Sepharose chromatography. Reversed-phase chromatography later further fractionated this fraction, resulting in 23 sub-fractions. Tricine SDS-PAGE monitored all separation processes. Fractions H11 and H22 strongly inhibited the growth of *Saccharomyces cerevisiae* and *Candida albicans*. Fraction H11 caused 100% death in S. cerevisiae in an antimicrobial assay. [2,23]

CNS depressant and anticonvulsant activity
Methanolic Extract of *Corallaria parvifolia* seed was evaluated for CNS depressant and anticonvulsant at 100 and 200 mg/kg doses. The study demonstrated that the extract produces a greater depressant activity than the reference drug (chlorpromazine-10 mg/kg) at 200 mg/kg. Similarly, it also offered 80% protection against locomotors activity, indicating a CNS depressant effect in mice. [2]

Proteinase inhibitor
Proteinase inhibitors can bind to and inhibit the action of insect digestive proteinases. So, the studies were carried out by investigating the short- and long-term effects of *Corallaria parvifolia* seed proteinase inhibitor on *Ae. aegypti* larvae (dengue/yellow fever) and a possible adaptation mechanism. It significantly affects *Ae.aegypti* larvae exposed to a non-lethal concentration of *Cp*TI during short- and long-duration assays, decreasing survival, weight and proteinase activities of midgut extracts of larvae. The zymographic profile of *Cp*TI demonstrated seven bands; however, three bands have trypsin-like activity. Moreover, the peritrophic membrane was not disrupted. The enzymes of *Cp*TI-fed larvae were found to be sensitive to *Cp*TI and to have a normal feedback mechanism, and also, the larval digestive enzymes were not able to degrade the inhibitor. In addition, *Cp*TI delayed larval development time. Moreover, *Ae. aegypti* larvae could not overcome the adverse effects of *Cp*TI,

indicating that this inhibitor, i.e., *Corallaria parvifolia* seed, might be used as a promising agent against *Ae. aegypti*. [24]

CONCLUSION

This review comprehensively summarises various chemical constituents and the pharmacological effects of *Corallaria parvifolia*. The number of phytochemicals present in this plant can be utilised for multiple purposes due to its numerous pharmacological activities. However, studies must be carried out to ensure the safety and possible adverse effects of *Corallaria parvifolia*.

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