

**EXPLORING THE THERAPEUTIC POTENTIAL OF *COMBRETUM INDICUM*:
BRIDGING TRADITIONAL WISDOM WITH MODERN MEDICINE**

Monica M.*, D. Visagaperumal and Vineeth Chandy

Department of Pharmaceutical Chemistry, T. John College of Pharmacy, Gottigere, Bengaluru- 560083, Karnataka, India.

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*Corresponding Author

Monica M.

Department of Pharmaceutical
Chemistry, T. John College of
Pharmacy, Gottigere, Bengaluru-
560083, Karnataka, India.**ABSTRACT**

Combretum indicum is commonly known as Basantilata in Bangladesh, Rangoon Creeper in English and Madhumalti in India. This plant belongs to the rich *Combretaceae* family. *C.indicum* is well known for its nutritional as well as medicinal value since many years. It is widely distributed all over the world, especially in China, India, Philippines, Bangladesh, Myanmar, Malaysia, and in most tropical countries as ornamental plants. In addition to the traditional use, the presence of many phytoconstituents such as phenolic compounds, flavonoids (quercetin and rutin), tannins, steroids, carbohydrates, protein, alkaloid, terpenoids (B-sitosterol and lupeol), quisqualic acid, amino acids, saponins, two forms of the cysteine synthase, isoenzyme A and isoenzyme B (enzyme), etc. *C.indicum* exhibits a wide range of pharmacological activities, including anti-inflammatory, anti-microbial, antioxidant, antipyretic, anthelmintic, immunomodulatory, anti-staphylococcal, anti-rheumatic, antiviral, antifungal, antiseptic, anti-diabetic, anti- hyperlipidaemic, anti-cancer, acetyl cholinesterase inhibition, anti-diabetic, diabetes wound-healing, anti-dyslipidaemia, larvicidal, central nervous system activity, and reducing blood lipid level activity. This review seeks to examine the pharmacological, phytochemical, and pharmacognostic research that has been done on *Combretum indicum* leaves and other parts of the plant.

KEYWORDS: *Combretum indicum*, Rangoon Creeper, taxonomical classification, chemical constituent, pharmacological activity.

INTRODUCTION

In traditional system of medicine such as Ayurveda and siddha, the main significance is given to the herbal plants.^[1] In current situation; the world population is more prone to use herbal medicines day by day. About 60 percent of world population uses the traditional medicinal plant. Due to the rise in pharmacological side effects and the financial load of the modern medical system, interest in traditional medicine is increasing dramatically among the general public, academics, and government.^[2] Up to 80,000 flowering plants are utilized as medicines globally, a huge collection of medicinal plant used in conventional medicine can be found in India.^[3]

Combretum indicum is commonly known as Basantilata in Bangladesh, Rangoon Creeper in English and Madhumalti in India. This plant belongs to the rich *Combretaceae* family (synonyms: *Quisqualis indica* Linn, *Quisqualis grandiflora* Miq, *Kleinia quadricolor* Crantz, *Quisqualis bracteata* P. Beauv., *Quisqualis glabra* Burman). It is widely distributed all over the world, especially in China, India, Philippines, Bangladesh, Myanmar, Malaysia, and in most tropical countries as ornamental plants.^[4] *Combretum indicum* is a deciduous, sub-woody climber and the branches length is

3-8 m. Leaves simple, oblong elliptic to elliptic, 5– 18 cm by 3–7 cm. Flowers fragrant, bisexual, pentamerous and tubular; calyx tube yellow pilose with five deltoid lobes 1.5–2.5 mm long with acuminate apices; petals 5 obviate to oblanceolate, 8–16 mm long, with obtuse apices, white turning to pink or red. Fruits dry capsule, 3–4 cm long, red turning to dark chestnut brown when ripe, narrowly ellipsoid to fusiform and sharply 5 ridged and usually one seeded.^[5]

Phytochemicals are certain plants with medicinal significance that act on the human body's physiological systems as specific chemical substances. These phytochemicals have been utilized in homeopathic and herbal remedies for medical conditions since ancient times. These are compounds that are not nutrients and that have the ability to prevent or shield against disease. Shifting medicinal plants for bioactive chemical becomes necessary in order to provide groundwork for future biomedical research. The active ingredients of numerous therapeutic plants have been identified and made available as useful drugs in contemporary medical systems and advancements in phytochemical techniques. Tarts, phenolic compounds, flavonoids, and alkaloids are the most significant of these bioactive substances.^[6]

Traditional and folk medicine both make use of the Rangoon creeper plant for a variety of medical objectives. Rheumatism can be treated with the roots of these plants, and the fruits or seeds have strong anti-helminthic properties that help remove parasitic worms from the body. Gargling with fruit decoction is another way to treat nephropathy. These plants leaves are utilized to relieve fever-induced discomfort.^[7]

MORPHOLOGY

Combretum indicum is a ligneous vine that grows up to 8 meters in length and 2.5 meters in height. This plant has elliptical leaves with rounded bases and acuminate tips. This plant grows to a height of 7 to 15 cm, and its arrangement is oriented counter-clockwise. Rangoon creeper has fragment, tubular flowers that range in colour from white to pink to scarlet.^[5] The fruit of the Rangoon creeper is ellipsoidal in shape, measuring between 30 and 35 mm, and it naturally has five noticeable wings. When



Fig. 1: *Combretum indicum* flower.

the fruit reaches maturity, it taste like almonds.^[7]

TAXONOMICAL CLASSIFICATION

Kingdom: Plantae Division: Magnoliophyta Class: Magnoliopsida Genus: *Combretum* Family: Combretaceae Order: Myrtales
Species: *C. Indicum*.^[8]

VERNACULAR NAME

English: Rangoon creeper, Chinese honey suckle, Burma creeper

Hindi: Madhu malati

Telugu: Rodha manoharam

Tamil: Irangunmalle

Malayalam: Pullanni

Marathi: Vilayati chambeli

China: Shih-chun-tzu

Indonesia: Udani

Malay: Akar dani.^{[8],[9]}



Fig. 2: *Combretum indicum* leaves.

PLANT DISTRIBUTION AND CULTIVATION

It is widely distributed all over the world especially on China, Philippines, Bangladesh, Myanmar and Malaysia and now also broadly grown in India as ornamental plant in most of the garden.^[4] In general, it needs full sun, frequent irrigation to keep the soil damp, and a support stand for the vine to grow on. Any plant that wants to grow properly needs to be given the necessities for healthy conditions, such as sunlight, water, fertilizer, etc.,^[10]

CHEMICAL CONSTITUENTS

In the past few decades, a great deal of research has been done on the phytochemical makeup of *Combretum indicum*. In addition to the traditional use, the presence of many phytoconstituents such as phenolic compounds, flavonoids (quercetin and rutin), tannins, steroids,

carbohydrates, protein, alkaloids, terpenoids (B-sitosterol and lupeol), quisqualic acid, amino acids, saponins, two forms of the cysteine synthase, isoenzyme A and isoenzyme B (enzyme), etc.^[4] *C.indicum* is rich in a variety of phytochemicals such as rutin, pelargonidin- 3-glucoside, quisqualic acid, trigonelline, pelargonidin, mannitol and it also contain amino acids like arginine, aspartic acid, glutamic acid, serine, glycine, proline, leucine, valine, alanine, threonine, asparagine, histidine, lysine.^[11] Asiatic acid, arjunolic acid, oleanolic acid, benzyl-β-D-xylopyranosyl-(1'' →6')-β-D-glucopyranoside, nudifloric acid, vanillin, gallic acid, and β-sitosterol are the eight components found in leaf methanol extract.^[12] Quinole carbonitrile, gallic acid, quercetin and rutin, pelargonidin-03-glucoside and linalool oxides (furanoid) are a few of the chemical components that can be extracted from flowers.^{[13],[14]}

Table 1: Chemical constituents of different plant parts.^[12-15]

Plant part	Chemical constituents
Leaves	Asiatic acid, arjunolic acid, oleanolic acid, benzyl-β-D-xylopyranosyl- (1'' →6')-β-D-glucopyranoside, nudifloric acid, vanillin, gallic acid, and β-sitosterol, quisqualic acid, mannitol, rutin, trigonelline, vitexin, orientin, isoorientin, D-glucose, D-fructose
Flower	Pelargonidin 3-glucosides, quisqualic acid, pelargonidin, trigonelline, rutin, gallic acid, quinole carbonitrile, linalool oxides, quercetin and 2,4-dihydro cucurbitacin
Seed	Stearic acid, palmitic acid, arachidic acid, mannitol, oleic acid, sterol, linoleic acid, myristic acid, citric acid, cyaniding monoglucoside, D- fructose, palmitic

	acid, and gamma- aminobutyric acid
Fruit	Trigonelline

PHARMACOLOGICAL ACTIVITY

Medicinal plants are a major source of medication in the traditional medical system. Although it has other medicinal uses as well, *Combretum indicum* is primarily employed as a herbal remedy. Due to the presence of various active constituents throughout the plant, *C. indicum* exhibits a wide range of pharmacological activities, including anti-inflammatory, anti-microbial, antioxidant, antipyretic, anthelmintic, immunomodulatory, anti-staphylococcal, anti-rheumatic, antiviral, antifungal, antiseptic, anti-diabetic, anti-hyperlipidemic, anti-cancer, acetyl cholinesterase inhibition, anti-diabetic, diabetes wound-healing, anti-dyslipidemic, larvicidal, central nervous system activity, and reducing blood lipid level activity. The numerous pharmacological actions of this plant are caused by a few phytochemical elements that are medicinally active.^[16]

Anthelmintic activity

Helminthiasis, sometimes called worm infection, is a macro parasitic disease that affects both humans and animals when a portion of the body becomes infected with parasitic worms. These helminthiasis is caused by common type of parasites like Round worm, Hook worm and Whip worms. Helminthiasis is a potentially fatal infection that can clog multiple systems. The intestinal worms cause immediate injury. Worm activity causes direct injury, including internal organ obstruction, pressure consequences, and parasite multiplication.^{[17],[18]}

A *C.indicum* Patra Kashaya was given to earthworm and the standard was taken as albendazol. The presences of tannins produced the anthelmintic activity. *Combretum indicum* (L.) leaf extract contains tannins that have larvicidal activity, affecting the viability of helminth larvae. These plant has the potential to eradicate the helminthiasis.^[19]

Antimicrobial activity

To investigate the antimicrobial activity of different extracts of plant *C.indicum*, it was observed that the ethanol, methanol, acetone, hexane and aqueous extract showed activity against bacteria and fungus.

The hot aqueous leaves extract and ethanolic extract showed Inhibitory property against all bacterial isolates with *B. licheniformis* (MTCC 530). The ethanolic extract of leaf is most susceptible with inhibition zone of 27.67 ± 0.33 mm followed by *P. aeruginosa* (MTCC 2453), *B. subtilis* (MTCC 441), *P. fluorescens* (MTCC 103), *B. mycoides* (MTCC 7343), *E. coli* (MTCC 739), and *P. putida* (MTCC 1654) with inhibition zones of 27.33 ± 0.33 mm, 27.00 ± 0.00 mm, 26.67 ± 0.33 mm, 24.67 ± 0.33 mm, 23.67 ± 0.33 mm and 21.33 ± 0.33 mm of diameter respectively.^[20] The ethanolic extract fraction showed inhibition of 97.72% against *A. alternate*, 92.30 % against *F. oxysporum*, 85.71% against *A.flavus* and

66.66% against *P.pallidum*.^[21]

The methanolic extract obtained from leaves and stem bark of *Combretum indicum* acts as an antibacterial activity against Staphylococcal infection.^{[22],[23]} The antibacterial activity is done by knowing the MIC 50 (Minimal Inhibitory Concentration 50) by invitro method and toxicity is identified by LD 50 (lethal dose, 50%) by in vivo studies.^[24] Leaf and bark extract of *Combretum* species showed the best result against *Bacillus subtilis* showing 22.4mm and 18.6 mm respectively.^[25]

Anti-inflammatory activity

Inflammation is a key factor in many diseases, including rheumatoid arthritis, atherosclerosis, and asthma, all of which have a high global prevalence. Pro-inflammatory cytokines like IL-1, TNF, INF- γ , IL-6, IL-12, IL-18, and granulocyte-macrophage colony- stimulating factor are released during an inflammatory response. Anti-inflammatory cytokines like IL-4, IL-10, IL-13, IFN - α , and transforming growth factor counteract this response.^[26]

Anti-inflammatory activity involves inhibiting PG synthesis, specifically COX at the site of injury. This decrease in prostaglandin E2 and prostacyclin lowers vasodilation and, indirectly, oedema. Reducing inflammatory cell accumulation did not lower the generation of other mediators such as leukotrienes, PAF, and cytokines, highlighting the need for several anti-inflammatory strategies.^{[27],[28]}

Combretum indicum hydro alcoholic extract has anti-inflammatory properties in a cotton pellet granuloma model and vascular permeability produced by acetic acid. The examination of phytochemicals showed the presence of flavonoids and polyphenols. Through their inhibition of prostaglandin formation, the polyphenols exhibit strong anti-inflammatory properties. Thus, the hydro alcoholic extract of *Quisqualis indica* Linn's anti-inflammatory properties can be linked to the polyphenols' suppression of PG synthesis and bradykinin production.^{[29],[30]}

Antioxidants activity

An antioxidant inhibits the oxidation of other substances. Oxidation is a chemical reaction in which a material loses electrons or hydrogen to an oxidising agent. Oxidation reactions can generate free radicals. Consequently, these radicals can initiate chain reactions. Chain reactions in cells can damage or kill nucleic acids, proteins, lipids, or DNA, leading to degenerative diseases. Antioxidants prevent chain reactions by eliminating free radical intermediates and inhibiting other oxidation reactions. Antioxidants are typically reducing agents like thiols, ascorbic acid, or polyphenols, as they oxidise themselves.^{[31],[32]}

The methanolic plant extract *C.indicum Linn* exhibits 95% antioxidant activity due to its redox properties. It acts as a reducing agent, scavenging free radicals like peroxide, hydroperoxide, and lipid peroxy. This inhibits the oxidative mechanisms that cause degenerative diseases. The study found that the methanolic extract of *Q. indica* (stem bark), particularly the chloroform soluble fraction, had considerable antioxidant properties.^{[33],[34]}

Antipyretic activity

Pyrexia, also known as fever, is an abnormally high body temperature caused by physiological stress, such as ovulation, thyroid secretion, exercise, central nervous system lesions, leukaemia, or microbial infections. The human body's natural defence system activates when it detects an infectious agent, creating undesirable environment for their existence.^{[35],[36]}

Fever is a medical symptom where the body's temperature rises above the normal range of 36.5-37.5 °C (98-100 °F). This is caused by an increase in the body's regulatory set-point.^[37] Increased muscular tone and shivering are brought on by this rise in set-point. Generally speaking, even though a person's body temperature is rising, they still feel colder. There is a sensation of warmth after the new temperature is attained.^{[38],[39]}

The *Quisqualis indica Linn* plant's methanolic leaf extract was thoroughly studied for its antipyretic properties against rats that were given a Brewer's yeast-induced pyrexia paradigm. The *Quisqualis indica Linn* plant is being promoted as a promising antipyretic plant species by the competent, potent, and comparable findings of its methanolic extract at dose levels of 100 mg/kg and 200 mg/kg.^[40]

Anti-diabetic activity

An endocrine condition that is frequently brought on by inadequate or insufficient insulin synthesis is diabetes mellitus. Diabetes can be referred to as an epidemic among individuals worldwide due to its potent spread and severe symptoms. A high-calorie diet, obesity, severe and ongoing mental stress, heredity, and an endocrine imbalance are all associated with the disease's rapid progression.^{[41],[42]}

An experimental rat model was used in a study to evaluate the antidiabetic efficacy of *Combretum indicum L.* leaf extract. The methanolic extract containing steroids was delivered at various dose levels in Streptozotocin-induced diabetic and non-diabetic rats. After 7 days of the treatment, the sacrifice was done and further studies were carried out. There was a significant reductions of elevated blood glucose, total cholesterol, triglyceride, and low-density lipoprotein-cholesterol observed in diabetic rat after the administration of *C. indicum* leaf methanolic extract. This study concluded the potential activity of *Combretum indicum* leaf to treat the symptoms of diabetic patients.^{[4],[43]}

Anti-tumour activity

A study has been completed to assess the antitumor activity of *Combretum indicum Linn*. Leaf and stem methanolic extract. In this study, the effect of *C.indicum* extract on the proliferative response of tumour cell lines was observed.^[44-46] The methanolic stem bark extract Tested on HEK293 cells. Recent research suggests that a methanolic stem bark extract with IC50 values below 20 µg/ mL is a promising candidate for further development. It is considered a conventional anti-cancer agent.^[47]

CONCLUSION

Herbal plants are highly valued in traditional medical systems such as Ayurveda and Siddha. In today's world, the global population is becoming increasingly reliant on herbal remedies. Approximately 60% of the world's population consumes traditional medicinal plants. Because of the increase in pharmacological side effects and the cost burden of the modern medical system, interest in traditional medicine is growing rapidly among the general population, academics, and the government. Up to 80,000 flowering plants are used as medicines around the world, with India having the largest number of medicinal plants used in traditional medicine. *Quisqualis indica Linn*, also known as Rangoon Creeper, is an easy-to-grow vining plant that is now more widely cultivated as an ornamental vine in gardens. It has a variety of traditional medicinal uses, some of which require the plant to be blended with other plant or natural ingredients. The ethno medicinal background and several research articles on *Quisqualis indica Linn* have led to the conclusion that this plant carries some important phytochemicals constituents showing various pharmacological activities, such as anthelmintic activity, anti-microbial activity, anti-inflammatory, anti-oxidant, anti-pyretic activity, anti-diabetic, anti-tumour etc.

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