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A REVIEW ON THE PHARMACOLOGICAL PROPERTIES OF IXORA COCCINEA

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ABSTRACT
Ixora coccinea is a medicinal plant commonly known as Jungle of geranium. This plant is widely cultivated across in india as an ornamental plant. This plant is used as an ayurvedic medicine in across india Sri Lanka, Bangladesh and as a part of folk medicine in Africa. Previous studies suggest that this plant has a wide range of medicinal properties such as antioxidative, anti-inflammatory, antimicrobial and antidepressant. This review explores its phytochemical composition, pharmacological effects, and therapeutic potential in inflammatory, antimicrobial, antioxidant, hepatoprotective, and neuroprotective contexts.

KEYWORDS - Ixora coccinea, anti-inflammatory, Phytochemicals, Antioxidant activity, Anticancer activity

INTRODUCTION
Ixora coccinea is a flowering shrub which belongs to the family Rubiaceae, there are around 500 species of the genus Ixora, only a few of them are commonly cultivated more in countries like India, Sri Lanka, Malaysia and Indonesia. This plant is known for several properties such as antioxidative effect, anti-inflammatory effect, antimicrobial activity, antimutagenic activity, wound healing property and chemo preventive activity [1]. In India I. coccinea known for both Ayurvedic and folk medicine across various states extensively. In Bangladesh it is used as a traditional medicine for diarrhea [2] Recent pharmacological studies confirm that I. coccinea contains phenolics, flavonoids, triterpenoids, sterols, alkaloids, tannins, and glycosides [3] The plant contains lupeol, ursolic acid, oleanolic acid, rutin, anthocyanins and flavonoids. Pharmacological studies support its antioxidant, antimicrobial, anti-inflammatory, antidiarrheal, hepatoprotective and chemo preventive activities [1]. The therapeutic exploration of Ixora coccinea follows a structured approach that integrates traditional knowledge with experimental evaluation. The process begins with the collection of plant material, followed by drying and grinding to obtain a fine powder. The powdered plant material is subjected to extraction to produce a crude extract, which is subsequently filtered and fractionated to obtain different extract fractions for further analysis.
Phytochemical analysis of *Ixora coccinea* demonstrates the presence of major bioactive constituents, including flavonoids, phenolic acids, terpenoids, phytosterols, fatty acids, and glycosidic derivatives. These compounds are widely recognized for their contribution to the medicinal properties of plant-based therapeutics.
Ethnomedicinal evidence indicates that *Ixora coccinea* has been traditionally used for the management of ulcers, wound healing, diarrhoea, colic, stomach-related disorders, dental problems, skin diseases, boils, headaches, and inflammatory conditions. These traditional applications provide the rationale for scientific validation.
Pharmacological investigations reveal that extracts and fractions of Ixora coccinea exhibit diverse biological activities, including anti-inflammatory, antioxidant, antimicrobial, chemoprotective, cytotoxic, wound-healing, antidiabetic, analgesic, anti-ulcer, anti-platelet, and anti-aggregation effects. The integration of ethnomedicinal uses, phytochemical composition, and pharmacological activities highlights the therapeutic relevance of Ixora coccinea and supports its potential in medicinal research [1].

1. Phytochemical Profile
Different part of this plant contains different compositions, leaves of the plant contains flavanols, kaemferol, quercetin, proanthrocyanidines, acids and ferulic acid. flowers yield cyanidins, flaconboides, and quercetin. [4] Studies show proanthocyanidins and polyphenolics in leaves and stems. There are other studies which claims the flowers of the plant contain cycloartenol esters and leaves titerpene, ixorene, ixorapeptide I, ixorapeptide II. [5] Preliminary phytochemical screening of aqueous and alcoholic extracts of *Ixora coccinea* flowers confirmed the presence of flavonoids, terpenoids, tannins, glycosides, saponins, and anthraquinone derivatives, which may collectively contribute to the plant's therapeutic efficacy [6]

Plant Part Examined	Reported Compounds / Phytochemical Class	References
Whole plant (from phytochemical surveys)	Lupeol, ursolic acid, oleanolic acid	[7,1]
Whole plant extracts	β-sitosterol	[7]
Flowers, leaves, and whole plant	Flavonol glycosides such as kaempferol and quercetin derivatives	[8,9]
Flowers and fruits (pigmented tissues)	Rutin, leucocyanidin, proanthocyanidins, anthocyanins	[9,7]
Roots and methanolic root extracts	Total phenolic compounds (unspecified mixture)	[9,3]
Fruit	Bioactive constituents (unspecified phytochemicals)	[9,10]

Table 1: Phytochemical Constituents Identified in Different Parts of *Ixora coccinea*.

Antimicrobial	Methanolic and ethanolic extracts exhibit inhibitory activity against microorganisms such as Escherichia coli, Staphylococcus aureus, and Candida albicans.
Antioxidant	High concentrations of flavonoids and phenolic compounds present in the leaves and flowers contribute to significant antioxidant potential.
Anti-inflammatory	Leaf and root extracts have demonstrated the ability to reduce inflammation in experimental animal models
Wound healing	Topical application of plant extracts has been reported to enhance wound healing, possibly due to the presence of tannins and flavonoids.
Hepatoprotective	Certain extracts have shown protective effects on the liver in experimental studies
Anticancer	Flavonoids such as quercetin exhibit cytotoxic activity against cancer cells in in vitro studies.

Table 2. pharmacological Activities and supporting Evidence

Adapted and modified from [7]

2 Anti-Inflammatory effects

Studies have found that the extracts from *Ixora coccinea* can significantly reduce swelling and inflammation. Researches have shown that the root extract can boost the immune system by stimulating the production of important cytokines, such as IL-1 beta, IL-8 and TGF-beta. [11]. Ethanolic extracts significantly reduce swelling and inflammatory markers in CFA-induced arthritis models [12]

3 Antioxidant Properties

Plants of various genera are commonly known for its antioxidant properties antioxidant property of a substance involves the removal of free radicals produced during oxidative stress or the delay of oxidative damage. *Ixora coccinea* shows the property by scavenging the free radicals from the methanolic root extract. ($IC50 \approx 6.6$ mg/mL) [1] Aqueous flower extracts exhibit significant reducing power in ferric and phosphomolybdenum assays. [13] Roots of Ixora coccinea have demonstrated strong antioxidant potential against multiple free radical systems. Studies using DPPH, FRAP and electrochemical assays confirmed high radical scavenging activity due to phenolic compounds such as gallic acid, catechin, chlorogenic acid, p-coumaric acid and quercetin.

4. Anti-Inflammatory, Analgesic, Antipyretic Effects

Ethanolic leaf extracts increase pain threshold, reduce writhing, and inhibit carrageenan-induced paw edema in rat models. [14] Antipyretic effects are seen in yeast-induced fever models. Methanolic leaf extracts showed significant anti-inflammatory activity by inhibiting immune cell infiltration, nitric oxide production and stabilizing cell membranes, supporting traditional use in inflammatory conditions [15]

5. Antimicrobial Activity

Methanolic flower extracts inhibit Staphylococcus aureus and Pseudomonas aeruginosa [16]. Leaf extracts show antibacterial and antifungal activity [17] Ether and methanolic leaf extracts demonstrated antibacterial activity against Escherichia coli, Pseudomonas aeruginosa, Salmonella typhimurium, Staphylococcus aureus and Bacillus subtilis, comparable to streptomycin [15].

6. Wound-Healing Activity
Ethanolic root extracts of Ixora coccinea significantly enhanced wound contraction and healing compared to standard drugs. The antimicrobial property of the extract prevents microbial invasion at wound sites, thereby promoting tissue repair. Increased collagen synthesis and upregulation of basic fibroblast growth factor have also been reported [17][12]
7. Anti-Arthritic Activity
Ethanolic extracts significantly reduce swelling and inflammatory markers in CFA-induced arthritis models [12]
8. Neuropharmacological Effects
Previous studies show methanol extract of *I. coccinea* can have antidepressant capacity evidence suggests that this activity can be due to the presence of phenolic component [15]
Stem extracts show antidepressant-like activity in forced-swim and tail-suspension tests, supported by GC–MS analysis [16]
9. Gastroprotective/Antidiarrheal Properties
Studies indicate reduced intestinal motility and fluid accumulation, supporting traditional use [4] Aqueous extract of *I. coccinea* shows Antidiarrheal Properties by controlling the activity mucosa of intestine mainly due to the presence of flavonoids, alkaloids, and tannins [16]
10. Cancer-Preventive Action
Flower extracts *of Ixora coccinea* exhibit selective cytotoxicity against murine tumour cell lines while sparing normal lymphocytes, indicating antitumour potential and therapeutic selectivity [18]. [19] demonstrated that the ethyl acetate fraction of *Ixora coccinea* leaves significantly inhibited the growth of A375 malignant melanoma cell lines, supporting its anticancer potential.
11. Antinociceptive Activity
Aqueous leaf extracts show significant analgesic activity in hot plate and formalin tests. The effect is dose-dependent, centrally mediated via dopaminergic pathways, and supported by antioxidant flavonoids, without evident toxicity [20]
12.Hepatoprotective Activity

CONCLUSION
Ixora coccinea has long been recognized in traditional medical systems across South and Southeast Asia for its broad therapeutic potential. Existing experimental studies consistently demonstrate its anti-inflammatory, antioxidant, antimicrobial, antidiarrheal, hepatoprotective, analgesic, and wound-healing properties. Phytochemical investigations have revealed the presence of flavonoids, phenolic compounds, triterpenoids, tannins, and glycosides, which are well known for their biological activity and cytoprotective effects. While current literature has primarily focused on gastrointestinal, dermatological, metabolic, and inflammatory properties direct evaluation of the neurological potential of *Ixora coccinea* remains limited and need further investigation.

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