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Unveiling The Medicinal Significance Of *Curcuma Amada:* A Phytopharmacological Insight

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ABSTRACT: Herbal medicine, also known as botanical medicine or phytomedicine, utilizes plant-based substances for therapeutic purposes. *Curcuma amada* Roxb. (mango ginger), a member of the Zingiberaceae family, is widely used in traditional systems like Ayurveda and Unani for its medicinal properties. Rich in phytoconstituents such as flavonoids, alkaloids, glycosides, curcuminoids, and volatile oils, *C. amada* exhibits antioxidant, antiviral, antibacterial, and anti-inflammatory activities. Traditionally, its rhizomes are used to treat skin conditions, digestive disorders, respiratory ailments, and inflammatory issues. This review explores the plant's phytochemical profile, traditional uses, and pharmacological potential, offering insights for future therapeutic research.

Key words: *Curcuma amada Roxb*, Phytoconstituents, Traditional medicine, Pharmacological activity, Therapeutic potential

INTRODUCTION

According to the World Health Organization (WHO) Global Health Estimates (2019), noncommunicable diseases (NCDs) account for approximately 74% of global mortality, with seven of the top ten leading causes of death now classified as NCDs a significant rise from four in 2000. This growing burden has contributed to increased global interest in traditional and alternative systems of medicine, including Ayurveda, Unani, Siddha, and Homeopathy. In response, the WHO, in collaboration with the Ministry of AYUSH, has initiated efforts to develop standardized terminologies and benchmarking practices for traditional medical systems, particularly Ayurveda and Panchakarma. [1]

Curcuma amada Roxb., commonly referred to as mango ginger, is a perennial, rhizomatous herb belonging to the Zingiberaceae family. Morphologically similar to common ginger (*Zingiber officinale*), it is distinguished by its characteristic raw mango aroma [2]. The genus *Curcuma* was first described by Linnaeus in 1753, with its name likely derived from the Arabic word *kurkum*, meaning "yellow." Native to the Indo-Malayan region, *C. amada* is now distributed widely across tropical Asia, Africa, and Australia. [2,3]

The rhizome of *C. amada* is particularly valued due to its high content of bioactive compounds, including, alkaloids, flavonoids, terpenoids, and phenylpropanoids [4]. These constituents contribute to its diverse pharmacological properties, such as antimicrobial, antidiabetic, antiobesity, anticancer, and anti-inflammatory effects.

Traditionally used in Ayurvedic and Unani medicine as a diuretic, antipyretic, expectorant, and digestive aid, *C. amada* also holds potential in various industrial applications due to its strong aroma and therapeutic benefits. [5]

Given its increasing relevance in both traditional medicine and scientific research, this review aims to provide a comprehensive overview of *Curcuma amada*, focusing on its taxonomy, distribution, phytochemical composition, pharmacological activities, and potential therapeutic applications.

DESCRIPTION [2,6]

Taxonomic Classification of *C. amada* Roxb

Kingdom	Plantae
Subkingdom	Phanerogamae
Division	Spermatophyta
Subdivision	Angiospermae
Class	Monocotyledonae
Series	Epigynae
Order	Scitaminales
Family	Curcuma
Genus	*Curcuma amada* Roxb

Vernacular Names of *C. amada* Roxb

English : Mango ginger

Sanskrit : Amrardrakam, Karpuraharida,

Hindi : Amahaldi,Malyalam: Mangainchi,

Tamil : Mankayinci,

Telugu : Mamidi Allam

Figure 1. Morphological traits of Mango ginger

Habit	Upright, Perennial, Rhizomatous herb grows up to 80cm to 1m tall.
Root	Fleshy, buff-colored rhizomes measuring 5–10 cm long and 2–5 cm wide. Rhizomes are divided into nodes and internodes with sympodial branching.
Leaves	Long, radical, sheathed, lanceolate, oblong, petiolate leaves arranged in tufts. Each plant has 5–6 leaves, dark green on the upper surface and pale green underneath
Flower	Unisexual, sterile, producing no viable seeds. Flowers are 2–4 cm long, pink, bloom throughout the year, arranged in terminal or axillary pseudoracemes
Fruit	Oblong pod, Thin septate, pilose, wrinkled

ORIGIN AND DISTRIBUTION

Curcuma amada Roxb., commonly known as mango ginger, is indigenous to the Indian subcontinent, with its origin traced to the Indo-Malayan region. From this area, it has spread widely across Asia, Africa, and Australia. In India, it is commonly found in West Bengal and is extensively cultivated in states such as Karnataka, Gujarat, Uttar Pradesh, Kerala, Tamil Nadu, and the Northeastern regions. Beyond India, *C. amada* is now widely grown in the humid subtropical climates of Southeast Asia and various parts of Africa due to its adaptability and ethnomedicinal importance [7].

PHYTOCHEMICAL PROFILE OF *CURCUMA AMADA* (MANGO GINGER)

Plant Part	Phytochemical Compound(s)	Solvent(s) Used for Extraction
Rhizome	Flavonoids, Phenolics, Terpenoids, Curcuminoids, Alkaloids Essential oils (camphor, β-myrcene, ar-turmerone)	Ethanol, Methanol, Acetone, Chloroform, Petroleum Ether, Hexane Steam Distillation / Hydro-distillation
Leaves	Flavonoids, Phenolics, Tannins, Terpenoids Volatile oils (camphor, curzerene, isoborneol)	Methanol, Ethanol, Aqueous Steam Distillation
Roots	Alkaloids, Saponins, Flavonoids	Ethanol, Methanol
Flowers	Phenolics, Flavonoids *(less studied)*	Methanol, Aqueous
Gum/ Exudate	Polysaccharides, Glycosides	Aqueous (hot/cold water)

Curcuma amada exhibits a broad spectrum of bioactive phytochemicals, with its rhizome being the most comprehensively examined component. Phytochemical analyses have confirmed the presence of flavonoids, phenolic compounds, terpenoids, alkaloids, and curcuminoids in the rhizome. Among the various solvents employed, ethanol and methanol have proven particularly effective in extracting high levels of flavonoids and phenolics [8,9]. Volatile oils distilled from the rhizome using a Clevenger-type apparatus predominantly contain β-myrcene, camphor, and ar-turmerone, along with other mono- and sesquiterpenes [9].

The leaves of *C. amada* also demonstrate significant phytochemical diversity, including flavonoids, tannins, phenolics, and terpenoids. Methanol has been reported to yield higher phenolic content relative to aqueous or ethanolic extractions [10]. Leaf essential oils, isolated through steam distillation, are particularly rich in compounds such as camphor, curzerene, and isoborneol [8,10].

Although limited, preliminary investigations into the roots have identified the presence of alkaloids, flavonoids, and saponins, primarily via methanol and ethanol extraction [8]. Floral parts remain largely uncharacterized; however, existing reports suggest they may contain flavonoids and phenolics similar to the leaf profile. Furthermore, the gum or exudate of *C. amada* has been traditionally utilized for its glycosidic and polysaccharide content, typically extracted through aqueous methods, and holds cultural significance in ethnomedicine and adhesive formulations [10,11]

PHARMACOLOGICAL ACTIVITIES

1.Antimicrobial and Antifungal Activities

Aqueous and various organic solvent extracts of *Curcuma amada* (mango ginger) have demonstrated significant antibacterial activity against multiple bacterial strains, including *Escherichia coli*, *Bacillus subtilis*, and *Staphylococcus aureus* [12]. Further studies have shown that extracts such as hexane, chloroform, ethyl acetate, acetone, and methanol are highly effective against *Bacillus cereus*, *B. subtilis*, *Micrococcus luteus*, *S. aureus*, *Listeria monocytogenes*, *Enterococcus faecalis*, and *Salmonella typhi* [12,13]

Additionally, both free and bound phenolic compounds extracted from *C. amada* rhizomes exhibit antibacterial potential. Solvent extracts including petroleum ether, methanol, chloroform, and ethyl acetate have shown significant inhibitory effects against *E. coli*, *Klebsiella pneumoniae*, *B. subtilis*, *B. cereus*, *S. typhi*, *Enterobacter aerogenes*, and *S. aureus* [14]

Volatile oil constituents such as myrcene and pinene also possess antifungal activity, particularly against pathogenic fungi including *Curvularia palliscens*, *Aspergillus niger*, *A. terreus*, *Fusarium moniliforme*, and *F. falcatum*. [14]

2. Hypotriglyceridemic Activity

Extracts of *Curcuma amada* Roxb. have demonstrated hypotriglyceridemic activity in Triton-induced hyperlipidemic rat models. These effects are attributed to modulation of hepatic triglyceride synthesis as well as enhancement of triglyceride clearance from the bloodstream. [15,16]

3. Hypoglycemic and Anti-Hyperglycemic Activities

Methanolic extracts of *C. amada* rhizomes have shown both anti-hyperglycemic and mild hypoglycemic effects in mice. Importantly, no toxicity was observed even at a high dosage of 650 mg/kg body weight, indicating a favorable safety profile.[17]

4. Anthelmintic Activity

Ethanol and dichloromethane extracts of *Curcuma* species (both at 150 mg/ml) exhibited potent anthelmintic activity, effectively inducing mortality in earthworms, thereby indicating strong anti-parasitic potential.[18]

5.Antioxidant Activity

Methanolic extracts of *C. amada* leaves and rhizomes demonstrated the highest hydrogen peroxide (H_2O_2) scavenging capacity, followed by chloroform and aqueous extracts. Rhizomes were found to exhibit stronger antioxidant activity than leaves. Furthermore, methanolic extracts efficiently inhibited in vitro generation of nitric oxide and superoxide radicals.[14]

6. Antiallergic Activity

Mango ginger has been traditionally used in herbal medicine for its antiallergic properties. Its inclusion in polyherbal anti-allergic formulations supports its therapeutic potential in allergic conditions.[19]

7. Anti-Inflammatory Activity

The ethyl alcohol extract of *C. amada* rhizomes exhibited significant anti-inflammatory activity in both acute and chronic inflammation models in albino rats, suggesting its efficacy in managing inflammatory conditions.[20]

8. Platelet Aggregation Inhibitory Activity

Ethyl acetate and acetone extracts of *C. amada* demonstrated notably higher platelet aggregation inhibitory activity in comparison to methanol extracts, indicating their potential in thrombosis prevention. [12]

9. Cytotoxic Activity

Hexane, chloroform, ethyl acetate, acetone, and methanol extracts of *C. amada* exhibited cytotoxic effects in both normal and cancerous cell lines. Interestingly, these extracts showed lower toxicity towards normal cells compared to cancer cells, suggesting selective cytotoxicity and potential for anticancer applications. [12]

CONCULSION

Curcuma amada (mango ginger) has been extensively utilized in traditional medicinal systems such as Ayurveda and Unani for the treatment of a wide spectrum of ailments, including skin diseases, respiratory disorders, and inflammatory conditions. Despite its established ethnomedicinal value, the plant remains insufficiently explored in modern pharmacological contexts. Current studies are predominantly limited to in vitro and in vivo models, lacking detailed phytochemical characterization and mechanistic insights. Given the increasing interest in plant-based therapeutics as alternatives to synthetic drugs due to concerns regarding cost and adverse effects there is a pressing need to elucidate the structure activity relationships of the bioactive constituents of *C. amada*. Such investigations may facilitate the identification and synthesis of novel pharmacologically active compounds, thereby contributing to the development of safe, effective, and affordable therapeutic agents derived from natural sources.

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