



Phytochemical and Pharmacological Profiling of *Coccinia Grandis*: A Comprehensive Review

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ABSTRACT:

Numerous traditional medicines currently in use are derived from medicinal plants, minerals, and organic substances. *Coccinia grandis* (L.) Voigt, commonly referred to as Ivy gourd, belongs to the Cucurbitaceae family and has been utilized in traditional medicinal practices for centuries. This plant is noted for its traditional applications in treating various ailments, such as jaundice, diabetes, ulcers, and fever. Additionally, it is recognized that the leaves and their components possess antioxidant, hypoglycemic, and hypolipidemic properties. This review encompasses the botany, chemical constituents, and pharmacological activities of the plant, highlighting its analgesic, antipyretic, anti-inflammatory, and antimicrobial effects.

Keywords : *Coccinia grandis*, prophylactic, rejuvenation, cucurbitacea, secondary metabolite, pharmacological activities.

Introduction :

Herbal drugs, derived from various plants, have been used for centuries in traditional medicines system like Ayurveda, siddha medicines and traditional chinese medicines. In some assian and African countries, 80% of the population depends on traditional herbal medicines for primary healthcare. Herbal medicines are easy for accessibility, safety and the ease with which they can be prepared. Herbal drugs having more benefits as compare to synthetic formulation with a longer pharmacological effect and lesser metabolic toxicity. In india, the use of the different part of medicinal plants For maintaining human health and improve health outcomes. Then the traditional plant medicines having a complete positive activity towards persons and complete pharmacological activity towards the disease.

Coccinia grandis commonly known as ivy guard or little guard also known as baby watermelon, and locally known as kundru, belonging into family cucurbitacea. It is native to Bengal and other part of india. *Coccinia grandis* grows abundantly all over india, tropical Africa, australlia, and throughout other oriental countries. *Coccinia grandis* is used by humans mostly as a food crop in several countries in australlia, asia, carribin and the southern united states pacific islands.



Every part of plant is beneficial in medicines and also in various preperatation that have been mentioned in the indigenous system of medicines like the anti-inflammatory, analgesic and antipyretic activity of fruit and leaves have been studied. The whole plant can be traditionally used for intention of

restoring health. The leaves are use in indian traditional medicines for treatment of diabetes, wounds, ulcer inflammation in eruption of the skin, fever asthma and cough.

Morphological characters

Synonyms

Coccinia cordifolia, *Coccinia indica*, *Cephalandra indica*, *Physedra*, *Staphylosyce*, Ivy gourd, *Tindora*, Kundru, Tendli, *Bryonia grandis*.

Taxonomical classification

Kingdom	: Plantae
Order	: Cucurbitales
Class	: Magnoliophyta
Family	: Cucurbitaceae
Subfamily	: Cucurbitoideae
Genus	: <i>Coccinia</i> wight and Arn.
Species	: <i>Coccinia indica</i>

Botany

Coccinia grandis is a perennial, climbing herb or trailing vine with glabrous stem and tuberous root. *Coccinia grandis* is a fast- growing perennial vine thatgrows several meters long. It can be forms mats that readily covers the shrubs and small trees.

1. leaf :



The leaf structure of *Coccinia grandis* is characterized by a broad, heart-shaped lamina that exhibits variability in size. Typically, the leaf measures between 5 to 10 cm in length and possesses a smooth, glossy surface. The leaves are arranged alternately along the stem. Hairs are present on the lower surface, while the upper surface remains hairless. Approximately 3 to 8 glands can be found near the base of the leaf. These leaves are utilized in culinary applications and serve as a traditional remedy. In Southeast Asia, crushed fresh leaves are applied to lesions to alleviate itching and bruising caused by insect bites. Medicinally, the leaves of *Coccinia grandis* are recognized for their antidiabetic properties, antioxidant effects, larvicidal activity, cooling effect on the eyes, ability to reduce lipids, treatment of skin diseases, and management of urinary tract infections.

2. Flower :



The plant exhibits dioecious characteristics, indicating that male and female flowers are borne on distinct plants. Male flowers are produced individually. These flowers are large, white, and star-shaped, measuring approximately 3 to 4 centimeters in length. The sepals are fused and feature five triangular to linear lobes. The corolla is also fused at the base and consists of five separate lobes. The coloration of the corolla ranges from creamy white to yellowish-orange. Each flower contains three stamens, and the ovary of *Coccinia grandis* is positioned inferiorly.

3. Fruit :



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The fruit exhibits an elliptical shape and is green with white stripes during its immature stage. Upon ripening, it transforms into a vibrant scarlet red. The dimensions of the fruit range from 25 to 60 mm in length and 15 to 35 mm in diameter, characterized by a smooth, hairless surface on its stalks. When fully ripe, the fruit can be consumed raw, while unripe specimens are suitable for cooking. It is frequently incorporated into curries. Additionally, the fruit is utilized in traditional medicine and is believed to have potential benefits for diabetes management. An alcoholic extract of the fruit has been found to possess hepatoprotective properties. The seeds measure 6 to 7 mm in length, are tan in color, and feature thickened margins. The roots and stem of the plant are succulent, which may aid in its survival during extended periods of drought.

Phytochemical Analysis:

The extract of *Coccinia grandis* is rich in various chemical compounds, including glycosides, alkaloids, flavonoids, terpenoids, phenols, and tannins. The methanolic extract derived from the fruit is particularly notable for its content of alkaloids, steroids, tannins, saponins, ellagic acid, phenols, glycosides, lignans, and triterpenoids. The roots are characterized by the presence of triterpenoids, the saponin coccinoside, the flavonoid glycoside ombuin 3-O-arabino furanoside, lupeol, β -amyrin, β -sitosterol, and stigmast-7-en-3-one.

Each part of the plant contains a diverse array of chemical constituents, detailed as follows:

I. Aerial Part:

Heptacosane, cephalandrol, β -sitosterol, and alkaloids cephalandrins A and B.

II. Fruits:

β -amyrin acetate, lupeol, cucurbitacin B, taraxerone, taraxerol, β -carotene, lycopene, cryptoxanthin, xyloglucan, carotenoids, β -sitosterol, and stigma-7-en-3-one.

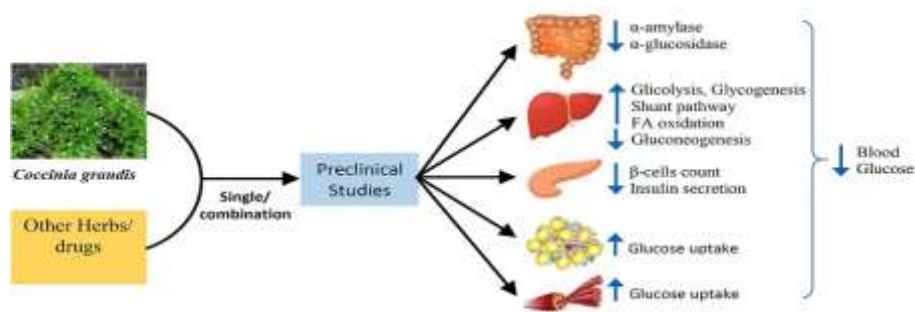
III. Roots:

Resin, alkaloids, starch, fatty acids, carbonic acid, triterpenoids, saponin coccinoside, flavonoid glycoside, lupeol, β -amyrin, β -sitosterol, and taraxerol.

Pharmacological Study

Antidiabetic Activity:

Medicinal plants are rich in various secondary metabolites and are essential in the treatment of diabetes mellitus. Each component of this medicinal plant exhibits significant antidiabetic properties through several potential mechanisms, including the regeneration of pancreatic β -cells, stimulation of insulin secretion, restoration of antioxidant enzyme activity, enhancement of glucose uptake, regulation of metabolic enzymes, improvement of lipid profiles, and inhibition of digestive enzymes. Furthermore, the synergistic effect observed when this plant extract is combined with other botanical extracts enhances its antidiabetic effectiveness while minimizing adverse effects..



Antiulcer Activity:

The anti-ulcer properties of the aqueous extract derived from the leaves of *Coccinia grandis* were evaluated using pylorus ligation and ethanol-induced ulcer models in experimental rats.

Aspirin-Induced Gastric Ulcers:

The effects of leaf powder, methanol extract, and aqueous extract of *Coccinia grandis* were assessed in rats suffering from aspirin-induced gastric ulcers. Both the leaf powder and methanol extract demonstrated a significant reduction in the ulcer index, an increase in mucus secretion, and a decrease in lipid peroxidation and superoxide dismutase activity.

Indomethacin-Induced Gastric Ulcers:

An ethanolic extract of *Coccinia grandis* leaves was tested on rats with indomethacin-induced gastric ulcers. The extract exhibited notable antiulcer activity, comparable to that of the standard medication omeprazole.

Antibacterial Activity:

The extracts from the leaves and stems of *Coccinia grandis* displayed antibacterial properties against both gram-positive and gram-negative bacteria. This investigation utilized the well-diffusion method, with ampicillin and amoxicillin serving as standards, and nutrient agar as the growth medium. The zones of inhibition for bacterial growth were measured and compared to the control. The water extract of the leaves and the ethanol extract of the stems demonstrated significant activity against *Shigella boydii* and *Pseudomonas aeruginosa*, comparable to the reference drugs.

Hepatoprotective Activity:

The alcoholic extract of *Coccinia grandis* fruit was evaluated for its hepatoprotective effects against CCl₄-induced hepatotoxicity in experimental rats. The extract significantly lowered serum levels of ALT, AST, and ALP, as well as bilirubin levels. The hepatoprotective effects of the extract may be attributed to the antioxidant properties of flavonoids present in the fruit. Flavonoids, triterpenes, and tannins, which are antioxidant agents found in *Coccinia grandis*, may inhibit free radical formation, confirming the known hepatoprotective activities of certain flavonoids.

Anti-inflammatory Activity:

The aqueous extract derived from the leaves of *Coccinia grandis* demonstrated greater efficacy in alleviating paw edema in rats induced by formaldehyde compared to the stem extract. Formaldehyde is known to cause cellular damage, leading to the release of histamine, prostaglandins, bradykinin, and serotonin. The leaf extract exhibited a more pronounced percentage inhibition of paw edema than both the stem extract and the standard reference drug, indomethacin. The inflammation triggered by formaldehyde results in the production of endogenous mediators.

Antipyretic Activity:

To assess antipyretic activity, a yeast-induced pyrexia model was employed. The administration of a 100 mg/kg dose of the methanolic extract from the leaves of *Coccinia grandis* significantly mitigated pyrexia in this model, showing results comparable to the standard antipyretic drug, paracetamol. The extract's antipyretic effect is attributed to its influence on prostaglandin biosynthesis, as prostaglandins are known to regulate body temperature.

Antioxidant Activity:

The antioxidant properties of *Coccinia grandis* are attributed to its ability to reduce power and its radical scavenging activity. Both ethanol and methanol extracts exhibit antioxidant effects, with the methanol extract of the fruit showing particularly potent antioxidant activity. This activity is likely due to the presence of flavonoids and anthraquinone glycosides. Additionally, the leaf extract of *Coccinia grandis* possesses antioxidant properties that may aid in wound healing. The stem extract, when using solvents such as petroleum, chloroform, and ethyl acetate, also demonstrates antioxidant activity, with ethyl acetate exhibiting stronger antioxidant effects than petroleum.

Anticancer Activity:

Several vegetables have been identified as having the potential to lower cancer risk, among which is *Coccinia grandis*. The anticancer properties of *Coccinia grandis* can be attributed to its antioxidant characteristics, which help mitigate the formation of nitrites resulting from decomposition. Specifically, the antioxidant properties of *Coccinia grandis* facilitate the reduction of ferrocyanide to ferrous ions. Furthermore, the methanol extract of the *Coccinia grandis* plant has demonstrated a notable decrease in viable cell counts while increasing the number of nonviable cells.

Antitussive Activity:

Research has explored the potential antitussive effects of *Coccinia grandis*. This plant has been traditionally utilized by indigenous communities in India to alleviate symptoms of asthma and cough. The methanol extract's antitussive efficacy has been compared to that of codeine. The extract from *Coccinia grandis* fruit exhibited a significant reduction in cough induced by chemical stimulation, showing effects comparable to codeine phosphate in a dose-dependent manner. Notably, a dosage of 400 mg/kg resulted in the highest cough inhibition observed within 90 minutes.

Larvicidal Activity:

The larvicidal properties of essential oil derived from the leaves of *Coccinia grandis* were assessed against three mosquito species: *Anopheles stephensi*, *Aedes aegypti*, and *Culex quinquefasciatus*. The LC50 and LC90 values for the larvae of these mosquito species were determined through probit analysis. Additionally, the fruit of the *Coccinia grandis* plant exhibited both larvicidal and pupicidal effects against *Anopheles stephensi* and *Aedes aegypti*.

**Conclusion :**

In the above discussion, the *Coccinia grandis* is a versatile medicinal plant and gives multiple benefits that can be concluded. *Coccinia grandis* has been widely studied for its pharmacological activities and regarded as universal panacea in ayurvedic medicine. The medicinal plant play a important role against various diseases it can be clear from this study. This type of plant extract are used to preparing different type of formulations based on patient compliance may produce tremendous changes in pharma industry and society will be free from many diseases.

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