



A MARVELLOUS PLANT- COCCINIA INDICA

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ABSTRACT

Plants are admirable source of medicine. Various literatures mentioned the use of plants in the curing of many disease. The constituents present in plants like flavonoids and phenolic compounds are found to exhibit diverse biological properties. Now-a-days, use of herbal medicine is increasing in developing countries, One of them is *Coccinia indica* (family-Cucurbitaceae) generally known as kundru/kanduri in Hindi and ivy gourd/little gourd in English. It is a quickly growing perennial climber. It is a plant that found in climate that is warm and humid. The whole plant of *Coccinia indica* having various pharmacological activities like antioxidant, analgesic, antidiabetic, antipyretic, Hypoglycemic, antiinflammatory, antiulcer, anticancer, antimalarial, antibacterial, hepatoprotective etc. This present review impart a requisite information on *Coccinia indica*, chemical constituents and pharmacological activities with respect to its morphological characters.

KEYWORDS: *Coccinia indica*, chemical constituents, Morphological characteristics and Pharmacological activities.

INTRODUCTION

In Conventional medicine, there are many medicinal plants that have the ability to treat many disorders. Now –a- days the use of herbal plants for the treatment of different diseases is increasing in developing country. Plants have played a remarkable role in maintaining human health and enhancing the standard of human life..^[1-3]

Coccinia indica (syn. *Coccinia grandis*, *Coccinia cordifolia*, *Cephalandra indica*) belonging to family Cucurbitaceae, Generally known as ivy gourd/little gourd in English or kundru/kanduri in hindi, bimu in Bengali and kovai in tamil.^[1-3]

It is indigenous to Bengal and other parts of India. *Coccinia indica* grows plentifully all over India and throughout the oriental countries. The plant has also been used broadly in Ayurveda and Unani practice in the Indian subcontinent.^[4-5]

The plant and its parts are used in treating various disease and disorders. The Part of the plant exhibit various phytochemicals like Saponins, flavonoids, sterols and alkaloids. These phytochemicals are responsible for numerous pharmacological activities. The whole plant is traditionally used for various medicinal purposes. Many clinical trials Studies also Proves effectiveness and safety of this plant. Leaves of this plant are used for treatment of ailments including diabetes, wounds, ulcers,

inflammation and earlier investigation showed that the crude extract exhibit antimicrobial, antioxidant, anti-inflammatory, analgesic, antidiabetic activity etc. Fruits also possess pharmacological activities like antidiabetic, antitussive and antibacterial activity.

This present review impart a requisite information on *Coccinia indica* with respect to its morphological characters, chemical constituents and pharmacological activities.^[6-7]

Morphological Characters

[1] **Synonyms-** *Coccinia cordifolia*, *Coccinia grandis*, *Cephalandra indica*.



[2] Scientific Classification

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliophyta
Order	Cucurbitales
Family	Cucurbitaceae
Genus	Coccinia
Species	Indica

[3] Vernacular names

S. No.	Languages	Names
1.	Sanskrit	Tundika
2.	Assam	Kawabhaturi
3.	Bengal	Bimbu
4.	English	Ivy-gourd
5.	Hindi	Kundaru ki bel, Kundru
6.	Punjab	Kanduri
7.	Tamil	Kovai
8.	Urdu	Kundururu
9.	Gujrat	Ghilodi

Habitat

It is a perennial plant. It grows vigorously and also cultivated in India. It is found in climate that is warm and humid. It is commonly known as kundru.^[6]

Description of Morphological characters

□ **Leaves-** The leaves of *Coccinia indica* plant either pentagonal or triangular in shape.

The leaves arranged alternatively along the stem. The lower surface of the leaf is hairy while upper surface is hairless. Leaves have pale green underneath and bright green upper surface, with astringent taste and characteristic odour. Leaves are ovate, alternate, simple, subflashed, palmately 5 lobed with obtuse apex. It shows reticulate venation with glabrous surface.^[7-10]

□ **Flower**

Flowers are star shaped, white and large. Flower is rarely in axillary clusters of 3 pedicel 50.0mm long solitary and monoecious, hypanthium 15.0 mm long, ovate, corolla lobe white, each flower has three stamens.^[11]

□ **Seeds**

Seeds are slightly papillose, yellowish grey, much compressed and ovoid rounded at the apex.^[11]

□ **Fruits**

Fruits are green in colour but when ripe it become glabrous and red in colour. The fruit is pulpy, ovoid to ellipsoid shaped and slimy in touch. Hairless on stalk.^[11]

□ **Roots**

Roots are break with a fibrous fracture and flexible, the fresh root is long tapering, thick, tuberous more or less tortones with a few fibrous rootlets attached to it. The cork is composed of rows of cells. Parenchyma is full of starch grains and through permeation of parenchyma with vascular elements is observed.^[9]

Phytochemical screening/Chemical constituents:-

S. NO.	Plant part	Chemical constituent
1.	Roots ^[12-16]	Flavonoid glycoside ombuin 3-o-arabinofuranoside
		Triterpenoid, saponin coccinoside -k (i). C ₄₁ H ₆₆ O ₁₂
		Stigmast-7-en-3-one
		Lupeol, β- amyryl and β- sitosterol
2.	Aerial parts ^[17-19]	Heptacosane
		Cephalandrol, C ₂₉ H ₅₈ O tritriacontane C ₃₃ H ₆₈ B-sitosterol alkaloids Cephalandrine a and Cephalandrine b.
3.	Whole plant ^[20]	Aspartic acid, Glutamic acid, Asparagine, Tyrosine, Histidine, Phenylalanine and Threonine Valine Arginine
4.	Fruits ^[21-24]	Taraxerone, taraxerol, and (24R)-24-ethylcholest-5-en-3β-ol glucoside
		-carotene lycopene cryptoxanthin and apo-6-lycopenal
		B-sitosterol and taraxerol

Pharmacological Profile of *Coccinia indica*□ **Pharmacology of leaves****[1] Antioxidant activity**

The leaves of *Coccinia indica* exhibit antioxidant activity. The ethanolic extract of *Coccinia indica* leaf

(CLEt) showed marked reduction in hydroperoxides and thiobarbituric acid reactive substances in rats when given orally for 45 days at a dose of 200mg/kg body weight. The extract also caused a significant increase in superoxide dismutase, reduced glutathione, glutathione

peroxidase, glutathione s-transferase and catalase in liver and kidney of diabetic rats. Diabetes is induced by streptozotocin which clearly shows the antioxidant activity of ethanolic extracts of *Coccinia indica* leaf.^[25]

[2] Anti-inflammatory and Analgesic activity

The leaves extract (aqueous) of the *Coccinia indica* shows anti-inflammatory and analgesic activity. A study was conducted to estimate both post and pre-treatment anti-inflammatory activities of the fresh leaves of *Coccinia indica* in rats at various dose levels by using the carrageenan-induced paw edema. The extract shows significant analgesic activity as compared to morphine at 300 mg/kg dose, which suggests the involvement of central mechanism. As comparable to paracetamol, the all doses of extract shows with maximum effect a significant reduction in Hyperpyrexia in rats. Overall the study established that aqueous extract of *Coccinia indica* possess marked anti-inflammatory activity, analgesic and antipyretic activity.^[26]

[3] Antibacterial activity

The leaves of *Coccinia indica* in aqueous and organic solvent (ethanol, petroleum ether and chloroform) extract showed effective antibacterial activity against the *Salmonella typhimurium*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Staphylococcus epidermidis* and *Enterobacter aerogenes* by broth dilution method and agar well diffusion method.^[27]

[4] Hepatoprotective activity

A study was organized to evaluate the Hepatoprotective activity of diethylether extract of leaves of *Coccinia indica* against liver toxicity induced by carbon tetrachloride in rats. The results provide that at a dose of 400 mg/kg body weight the *Coccinia indica* leaves shows hepatoprotective activity and it was comparable with silymarin a standard hepatoprotective at 125mg/kg body weight.^[28]

[5] Chemoprotective activity

The chemoprotective activity of *Coccinia indica* genotoxicity, hepatotoxicity and oxidative stress induced by cyclophosphamide was carried out in 2013 by Nitharwal and co-workers. In this study rodents were orally pre-treated with *Coccinia indica* extract (200, 400 and 600mg/kg) for five consecutive days. *Coccinia indica* extract marked reduced the MDA level and increased glutathione level in the brain. It also significantly reduced the increased Serum biomarker enzymes like Aspartate aminotransferase and alkaline aminotransferase indicating the protective effect of *Coccinia indica* extract against genotoxicity, oxidative stress as well as hepatotoxicity induced by cyclophosphamide.^[29]

[6] Antihyperlipidemic activity

The leaves extract (ethanolic) of *Coccinia grandis* exhibit C₆₀-polyprenol significantly decreased Serum triglyceride, glycerol and total cholesterol and in high fat

diet (HFD)-fed dyslipidemic hamsters at a dose of 50 mg/kg body weight. According to this study the leaves of *Coccinia grandis* contain polyprenol exhibit marked antidiabetic activity.^[30]

[7] Antidiabetic activity

A study was designed to evaluate the hypoglycemic and hypolipidemic effect of *Coccinia indica* aqueous extract in diabetic rats. Diabetes was induced by alloxan. The study concluded that continuous administration of *Coccinia indica* reduces the increased level of serum lipids secondary to the diabetic state.^[31]

[a] A study shows that the aqueous-methanolic (40:60) extract of root of *Musa paradisiaca* and leaf of *Coccinia indica* in separate as well as in mixture shows antihyperglycemic activity on diabetic rats. There is a marked remedial effect on carbohydrate metabolic enzymes as well as blood glucose level and quantity of skeletal muscle glycogen and liver. After treatment with aqueous methanolic extract of both plants in separate as well as in combination at a concentration of 80 mg/kg body weight/day to STZ induced diabetic rats. After the combination of extract of both plants parts the serum insulin level that was reduced in STZ-induced diabetic rat retrieved significantly.^[32]

[b] A study has been organized to evaluate the antidiabetic activity of methanolic polyherbal extract of *Coccinia indica* leaves in diabetic rats. Diabetic rats in different groups received treatment with two concentrations of the extract (150 and 300 mg/kg, p.o.) with standard drug and saline, under similar conditions. When comparable to glibenclamide after 10 days of treatment there is significant reduction of elevated blood sugar level. The results showed that the polyherbal extracts of leaves of *Coccinia indica* shows distinct antidiabetic property.^[33]

[c] A study has been conducted to evaluate the effect of aqueous and cold extracts of *Coccinia indica* leaves on serum biochemical analysis and fasting blood sugar levels in Streptozotocin induced diabetic rats. The results concluded that all the extracts of *Coccinia indica* at dose level of 1/5th of their lethal doses produced a significant antidiabetic activity.^[34]

(8) Larvicidal activity

A study has been conducted to investigate the larvicidal activity of crude ethyl acetate, acetone, methanol, petroleum ether and hexane extracts of the leaf of five species of cucurbitaceae family, *Coccinia indica*, *Citullus colocynthis*, *Cucumis sativus*, *Trichosanthes anguina* and *Momordica charantia* against the early fourth instar larvae of *Culex quinquefasciatus* and *Aedes aegypti*. After 24 h of exposure the larval mortality was observed. Results show that the highest larval mortality was found in methanol extracts of *Coccinia indica*, petroleum ether extract of *Cucumis sativus*, *Momordica charantia* and

acetone extract of *Trichosanthus anguina* against the larvae *Aedes aegypti* (LC₅₀=74.57, 309.46, 492.73, 199.14 and 554.20 ppm) and against *Culex quinquefasciatus* (LC₅₀=88.24, 377.69, 623.80, 207.61 and 842.34 ppm) respectively.^[35]

(9) Antiulcerogenic activity

The effect of methanol and aqueous extract of *Coccinia grandis* (Linn.) Voigt, leaves on gastric ulcer induced by aspirin in rats were investigated. The leaf powder showed marked increase in mucus secretion with marked decrease in ulcer index and decrease in level of SOD and LPO activity. At equivalent dose to that of the powder the methanol extract also showed marked changes in mucus secretion, LPO, SOD with marked decrease in ulcer index as comparison to Famotidine (std. drug) receiving group which showed no effect on the mucus secretion. The result showed that the *Coccinia indica* possess antiulcerogenic activity due to increase mucus secretion and antioxidant action.^[36]

□ Pharmacology of Aerial parts

(1) Antidiabetic activity

The aerial parts of *Melothria maderaspatana* and *Coccinia indica* were investigated in diabetic rats induced by STZ to evaluate their antihyperglycemic and hyperlipidemic effect. At a dose of 100 or 200 mg/kg, b.w, p.o. for 14 days, the rats were concurrently treated with ethanolic extract and it shows significant antihyperglycemic and hypolipidemic effect. Biochemical investigation of cholesterol, LDL, plasma glucose, HDL, ALP, SGPT and SGOT were done from blood sample. Extract are also effective on biochemical parameters. The whole investigation observed that the combination of the two plant extracts produce better significant results in treating diabetes.^[7]

□ Pharmacology of Whole plant

(1) Antistress and free radical scavenging activity

A study shows that when 50% ethanolic extract and Ginseng was used as a standard the ethanolic extract of whole plant of *Coccinia indica* showed marked antistress and free radical scavenging activity. When administered *Coccinia indica* orally, it is capable of improving the capacity to tolerate non-specific stress in animals by studied large no of parameters and it also shows free radical scavenging activity.^[38]

□ Pharmacology of fruits

(1) Antidiabetic activity

[a] Gunjan et al in 2010 evaluate the Antihyperglycemic activity of Hydro-alcoholic extract (1:1) of *Coccinia indica* fruit (200 mg/kg). The results shows for 14 days chronic administration of *Coccinia indica* fruit extract (200 mg/kg) markedly decrease the blood glucose level of the diabetic animals as compared to diabetic control group. When compare to Glibenclamide the fruit extracts shows remarkable antihyperglycemic activity.^[39]

[b] The *Coccinia indica* ethanolic extract (250 mg/kg) shows hypoglycemic activity in Alloxan induced Diabetic rats. The effect of *Coccinia indica* fruit extract (ethanolic) especially at 250 mg/kg was comparable to that of standard drug Glibenclamide.^[40]

[c] On kidney damage which is mediated by diabetes, the effect of *Coccinia indica* consumption was determined in both control group and diabetic rats group which were fed with AIN-76 diet supplemented for a period of 2 months with *Coccinia indica* fruits and leaves individually at 10% and 5% respectively. They show advantageous effect on key antioxidant enzymes of the kidney, Furthermore an increase in fibronectin and laminin as a result of diabetes was alleviated in *Coccinia indica* fed rats. The result shows that the consumption of kundru is beneficial in attenuating diabetes mediated deleterious effect on the kidney.^[41]

(2) Antioxidant activity

A study was conducted to evaluate the antioxidant activity of the methanolic extract of fruit of *Coccinia grandis* Linn. Voigt. The antioxidant activity was compared to standard antioxidant, Butylated Hydroxyanisole and has been investigated by using three in vitro assays. The result shows that due to the presence of flavonoids the plants shows free radical scavenging and antioxidant activities.^[42]

(3) Antimicrobial activity

The aqueous extracts and organic extracts (petroleum ether and methanol) of fruit of *Coccinia indica* were investigated for antibacterial activity against some pathogenic bacteria. The organic extracts showed the highest activity as comparison to aqueous extracts against the bacteria. The antimicrobial activity is due to the phytoconstituent like alkaloids, tannins, saponins, flavonoids, glycoside and phenols.^[43]

(4) Anthelmintic activity

A study was conducted to investigate the anthelmintic activity of different extracts of *Coccinia indica* fruits using ethyl acetate, methanol, petroleum ether and water as solvents. All the extracts with various concentration (25 and 50mg/ml) were tested which involved determination of time of death and time of paralysis of the worms. It was compared with albendazole as standard and normal saline as control. The study shows the potent anthelmintic activity of *Coccinia indica* against earthworm infection.^[44]

(5) Wound healing activity

A herbal gel was formulated which containing ethanolic fruit extract and aqueous fruit extract of *Coccinia indica* and evaluate the wound healing activity. The gel markedly increased the breaking strength as compared to control than aqueous extract. Results indicate that treatment with ethanolic extract gel of *Coccinia indica* fruits may have favorable influence on the various

phases of wound healing like wound contraction and resulting in faster healing than aqueous extract.^[45]

(6) Antiliathic activity

Renal stone in rats is induced by ethylene glycol. The ethanolic extract of *Coccinia indica* fruit (100 and 200 mg/kg) possess a dose dependent marked anti-lithiatic activity on treatment. It also caused reduction of oxalates, calcium, phosphorus and creatinine in blood serum level at a dose of 100 mg/kg. As compare to reference standard the ethanolic extract of *Coccinia indica* was found effective.^[46]

(7) Anticonvulsant activity

A study was organized to evaluate the anticonvulsant activity of fruit extract of *Coccinia indica* against induced maximal electroshock seizure model in rats. At the dose of 600 mg/kg *Coccinia indica* shows potent anticonvulsant activity as compared to 200 mg/kg and 400mg /kg. The result shows that the ethanolic extract of fruit contain many flavonoid and steroids and these phytoconstituents have been reported for hepatoprotective activity. Therefore there is chances that ethanolic extract of *Coccinia indica* fruit may possess anticonvulsant activity.^[47]

(8) Antitussive activity

Methanolic extract of fruits of *Coccinia grandis* exhibit marked antitussive activity. As compared to codeine phosphate the extract shows marked antitussive effect at a dose of 100,200 and 400 mg/kg, p.o in Sprague dawley rats within 90 min of performing the experiment. The extract might be acting via the Central nervous system.^[48]

(9) Antiinflammatory and antinociceptive activities

Paw edema induced by carrageenin (1%) and histamine (10^{-3} g/ml, or 1 ml) in rats is inhibited by fresh fruit juice powder of *Coccinia indica* at the dose of 50-200mg/kg. The writhing induced by acetic acid in mice is significantly prevented by *Coccinia indica* fresh fruit juice powder and the % of inhibition were 16.98%-35.47%, which is equivalent to 36.67% produced by brufen.^[49]

(10) Hepatoprotective activity

A study was organized to investigate the hepatoprotective activity of aqueous fruit extract of *Coccinia indica* against hepatotoxicity induced by paracetamol in albino rats. The activity was evaluated by the liver function marker enzymes in the serum (AST, ALT, ALK-P, TB and histopathological studies of liver, as comparison to silymarin group.^[50]

□ Traditional uses

The whole plant and parts of *Coccinia indica* used in various diseases. The leaves of *Coccinia indica* are applied externally in eruptions of the skin and leaves are boiled in gingelly oil and applied in itch, ringworm and psoriasis. Leaves are also used as antispasmodic and

expectorant. Oil is used as an injection into chronic sinuses. In the treatment of cathartic the bark of, root of *Coccinia indica* is used. In bilioussness and disease of blood the fruit of *Coccinia indica* is used. The green fruit is chewed to cure sores on the tongue.^[8]

CONCLUSION

Now –a –days herbal plants are used in preparation of many drugs. *Coccinia indica* is a marvelous plant which is used to cure many ailments. A no. of studies are conducted on different parts of *Coccinia indica* plant. Many pharmacological and phytochemical studies on *Coccinia indica* reported its therapeutic properties. Pharamacological activities of this plant parts are due to presence of many phytoconstituents like flavonoids, saponins, glycosides, alkaloids, phenols, lupeol, cephalandrine A, cephalandrine B, taraxerol and taraxerone etc. Further studies are required to investigate and to determine the role of *Coccinia indica* in therapy of different diseases. From this study it is clear that the medicinal plants play a fundamental role against various diseases.

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