

COCCINIA GRANDIS (L) VOIGT- REVIEW**Varuna V.***

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ABSTRACT

The Cucurbitaceae family is commonly known as gourd, melon and pumpkin family. The family of *Coccinia grandis* (L.) Voigt, is Cucurbitaceous, comprises 960 species. (English name: ivy gourd) commonly known as “*Kovai*”, also called tindora' (*tindori, tindoori*). It is fast-growing perennial vine that grows several meters long. *Coccinia grandis* is used by humans mostly as a food crop. The aim of this article briefly reviews on up to date and comprehensive literature analysis in areas of chemical constituents, proved pre-clinical and clinical trails along with its medicinal uses in different streams of medical science. The data are collected from the ancient Siddha

literature, Botany literature and through the scholar and pub med internet arms. It has been used in traditional medicine as a household remedy for various diseases. The whole plant of *Coccinia grandis* having pharmacological activities like analgesic, antipyretic, anti-inflammatory, antimicrobial, antiulcer, antidiabetic, antioxidant, hypoglycemic, hepatoprotective, antimalarial, antidyslipidemic, anticancer, antitussive, mutagenic. *Coccinia grandis* have been to possess expectorant, antispasmodic, antiperiodic, stimulant and diaphoretic properties. Therefore the final note emphasizes this plant widely being used for treatment of diabetes, hypertension, fever, jaundice, and gastrointestinal problems and to relieve pain. The *Coccinia grandis* has good potential of medicinal values and chemical constituents.

KEYWORDS: *Coccinia grandis*, chemical constituents, preclinical, clinical.

INTRODUCTION

The Indigenous system of medicine namely *Siddha* Medicine, *Ayurveda*, *Unanim*, has been existence for several centuries. The word *siddha* which means in *sanskrit* “realized”, one who

is endowed with supernatural faculties called “*siddhi*”, refers to groups of tantric yogis who have acquired supernatural powers through austere ascetic practices. Siddha medicine is one of the traditional systems.

Coccinia grandis, also called tindora' (tindori, tindoori) commonly known as “Kovai” belongs to the family Cucurbitaceae. *Coccinia grandis*, also called tindora' (tindori, tindoori) commonly known as “Kovai”. It is perennial climber with slender, cylindrical, glabrous stems and simple tendrils; There has been plenty of research work on this plant as evidenced by the literature review presented in this paper.

Taxonomy of *C. grandis*

Kingdom : Plantae

Order : Cucurbitales

Family : Cucurbitaceae

Genus : *Coccinia*

Species : *C. grandis*

Binomial name : *C. grandis* (L) J. Voigt

Medicinal botany view of *C. grandis*

Leaves

Leaves- simple, alternative, 5-10cm long, 4.5-9cm broad, variable in form, usually broadly chordate-ovate in outline with the basal sinus triangular, obtuse, apiculate, more or less 5 lobed, distantly dentate, quite glabrous on both sides, rather succulent, dull green above, glaucous beneath, ciliate along the margin, finely punctate, provided with several large flat circular glands near the axils of veins beneath, especially at the base, petioles 2-3.2cm long.

Flowers

Flowers- regular, unisexual white with green veins, dioeciously, solitary, axillary, peduncles, 1-flowered; male flowers: peduncles 4-6.5cm long, subfiliform; sepals 5, fused into a broadly campanulate glabrous calyx-tube, 4.5 mm long, calyx teeth 2.5 mm long and linear; corolla campanulate of 5, fused petals, 2.5 cm long, veined, pubescent inside, glabrous outside, segments triangular 1.6 cm long; stamens 3, anthers connate, cells conduplicate, filaments free; female flowers: peduncles 3-3.5 cm long; perianth similar to male flower; staminodes subulate, 2.5 mm long, hairy at base; ovary inferior, glabrous, fusiform, 1.3-1.5 cm long with parietal placentas, style short, stigmas 3, long and hairy; Flowers from June to August.

Fruit

Fruit- 2.5-5 cm long, fusiform-ovoid, cylindrical, slightly beaked, marked when immature with white streaks, bright scarlet when fully ripe; seeds oblong-ovoid, much compressed, smooth, yellowish-grey.

Distribution

Occurs throughout the India, Ceylon, Malaya and tropical Africa. In Ceylon, it is common in the low-country especially in dry regions in bushy places. Jaffna, Anuradhapura, Pollannaruwa, Ritigala, Hunnasgriya, Colombo, Galle, Matara, etc

Chemical composition**C. grandis is reported to contain following type of compounds**

- This plant contains an enzyme, a hormone and traces of an alkaloid, Fruit: β - Amyrin acetate, β - Sitosterol, β - Carotene, Cucurbitacin B, Lycopene, Lupeol, Taraxerol, Taraxerone, Roots: Alkaloids, β - Amyrin, β - Sitosterol, Carbonic acid, saponin-Coccinoside, flavonoid- Ombuin 3-*o*-arabinofuranoside, Lupeol, Resins, Stigmast-7- en-3- one (Jayaweera.,2006)
- Chemical analysis showed that the plant is rich in nutrients, especially antioxidant compounds such as total phenol, vitamin C and β -carotene (Khatun *et al.*, no date)
- Fatty Acids
The plant contains Palmitoleic acid, Palmatic acid, Heptadecanoic acid, Linolenic acid and Linolelaidic acid (Ibtisam et al., 2012)
- Amino acids content
The composition and amount of amino acids in *C. grandis* essential and non-essential.

Medicinal uses

- **For Diabetes**
- Decoction is prepared with 120 gm fresh leaves or entire creeper of *C. grandis* plant and 120 ml is given twice a day.
- 20 g of leaves of *Coccinia grandis* which were mixed with a measured amount of scraped coconut and table salt.
- **Laxative**
The root bark powder of plant is given in dose of 2 teaspoonful before going to bed with hot water.

- **Sore on tongue**

Chewing fruits helps to get relief from tongue sores.

- **Leaf**

- a. It has the cooling property to eye and prevent the *perumpun*, *sirusiranku*, *udalvekkai*, *neeradaippu*.
- b. The leaves are dried, powdered and given 675mg to cure above disease.
- c. The paste of leaves is applied externally in ringworm, psoriasis and itching.
- d. The ghee added with leave juice and applies for *sirangu*.
- e. The leaves boiled with oil and apply for *padai*, *sori*, *sirangu* and *vedippun* Juice of leaves is also useful in treatment of diabetes and malarial infection.
- f. Leaf extract of the plant possesses mutagenic effect against *Neurospora crassa* fungus.
- g. Leaf extract is also useful in treatment of gonorrhoea.
- h. It used as diaphoretic and apply to the body.

- **Itches, skin abscesses, insect stings**

The leaves are grinded to make paste and applied externally on affected area.

- **Excess body heat**

In case of excess body heat, extract 5 teaspoon juice of ivy gourd leaves and drink with glass of water, thrice a day for three days.

- **Urine blockage**

Take 2 teaspoon root and boil in 150 ml water till volume reduced to half. Filter and drink.

C. grandis in Siddha Medicine

In the Siddha text of Kunapadam Porutpanpiyal says it is under the Cucurbitacea family Sanskrit name is Bimbi, tamil name is Kovai Scientific name is *Coccinia grandis*(Linn) Voigt.

This is climber. *Inippu kovai* and *kaippu kovai* are the two variety of *kovai* and *karunk kovai* it is another variety also available. It is divided in to three groups according to shape and colour of the kovai, there are

1. Mooviral kovai
2. Iviral kovai
3. Namak kova

Leaves, Unripe fruit, Stem, Tuber are used for medicinal purpose

Organoleptic characters

Innippu kovai

Suvai : Sweet

Veeriyam : Hot

Vipakam : Sweet

Kaippu kovai

Suvai : Bitter

Veeriyam : Hot

Vipakam : Pungent

The Pharmacological action of this plant:

General- Expectorant, Antispasmodic, Antiperiodiac

Leave -Stimulant, Diarphoratic

The leaves

According to the ancient Siddha text mentioned the uses of *C.grandis* following as

“Kannunk kulirchiperumnk kasamodu vayu varum

Punnunch chirankum purandohum- nannudalum

Meethilar veppakalum veelaneerkkadehunk

Kothilak kovai yilaikku”

Kunapadam text book by Murukesumuthaliyar,Page no 414

The leaves are bitter, sweet, astringent and cooling, and are useful in vitiated conditions of kapha and pitta.

It has the cooling property to eye and prevent the *perumpun*, *sirusiranku*, *udalvekkai*, *neeradaippu*.

The leaves are dried, powdered and given 675mg to cure above disease.

The paste of leaves is applied externally in ringworm, psoriasis and itching.

The ghee added with leave juice and applies for *sirangu*.

The leaves boiled with oil and apply for *padai*, *sori*, *sirangu* and *vedippun*.

Juice of leaves is also useful in treatment of diabetes and malarial infection.

Leaf extract of the plant possesses mutagenic effect against *Neurospora crassa* fungus.

Leaf extract is also useful in treatment of gonorrhea.

It used as diaphoretic and apply to the body.

The unripe fruit

The unripe fruit and *wattal* has the following property.

Unripe fruit-Prevent the *Suvaiyinmai, neenka weppam, kapam, suram.*

Wattal- prevent the *esuvayinmai and karappan.*

Chew the unripe fruits; it will cure the ulcer in tongue.

Cook the unripe fruits; it prevent from vekkkai.

Fruit juice is useful in treatment of infections caused by helminthes.

Fruit is used in treatment of fever, leprosy, infective hepatitis and jaundice.

Fruit is also useful in asthma and cough.

“Vayin arosaka poam mara alalaiyarum

Noyit kapamahalum nunnidaiye-thuyavathan

Vattat karusimaruvukarap panpohunch

Suthako vaikkayaich chol.”

The tuber or root

The tuber or root will cure the soolai, skin disease, respiratory disease, muppini, mathumeham, nappun and azhal noai,

The *uchikkarandi* juice of tuber cures the *neerizhivu* and *padai*.

The juice of tuber used as adjuvant for *neerizhivu*.

The stem or tuber use for the *neerkaddu*.

Pharmacological studies

Several research workers have reported different biological activities of *C. grandis* in various in vitro and in vivo test models. These have been described in details in following headings.

a. Antiulcer

Antiulcerogenic effects of *Coccinia grandis* (Linn.) Voigt leaves powder, its methanol and aqueous extracts were investigated on Aspirin-induced gastric ulcer model in rats, on the basis results, the leaf powder showed a significant increase in mucus secretion and decrease in level of lipid peroxidation (LPO) and Superoxide dismutase (SOD) activity. Methanol extract at an equivalent dose to that of the powder also showed a significant decrease in ulcer index with significant changes in mucus secretion, LPO and SOD anti ulcerogenic potential of this plant due to increased gastric mucus secretion and has antioxidant activity.(Mazumder *et al.*, 2008). The anti-ulcer activity aqueous extract of leaves of *Coccinia grandis* was

investigated in pylorus ligation and ethanol induced ulcer models in experimental rats, In both models the common parameter determined was ulcer index. Aqueous extract of *Coccinia grandis* at doses of 250 and 500 mg/kg produced significant inhibition of the gastric lesions induced by pylorus ligation induced ulcer and ethanol induced gastric ulcer. The extract (250 mg/kg&500 mg/kg) showed significant ($P<0.05$) reduction in gastric volume, free acidity and ulcer index as compared to control. This present study indicates that aqueous extract of *Coccinia grandis* have potential antiulcer activity in the both models. (Girish, C & Vineela, S & NarasimhaReddy, Y & Reddy, O.V.S. & Rajasekhar, K.K. & Shankarananth, 2011). Evaluated the Ethanol, aqueous and total aqueous extract for antiulcer activity in pylorus ligation induced gastric ulcer. Ethanolic extract showed the anti-secretory mechanism for their anti ulcerogenic activity. Ethanolic extract of plant extract at 400 mg/kg exhibited antiulcerogenic activity as that of Omeprazole. (Manoharan and John, 2010).

b. Wound healing activity of chloroform extract of *Coccinia grandis* on excision, incision and deep space wound model in rats, this study reveals the *C.grandis* has wound healing effect when formulated as ointment and could therefore explain the success sores, boils and wounds.(Deepti *et al.*, 2012)

c. Phytochemical Characteristics, Antimitotic, Cytotoxic and Anti-inflammatory Activities of *Coccinia grandis* (L.) J.Voigt. As per the result of the study reveals the Leaf extract showed strong inhibitory effect on seed germination, seedling's root growth of wheat and brine shrimp lethality with LC50 at 24.20 $\mu\text{g/ml}$. Antitumor assay showed inhibition of tumor induction on potato discs due to *Agrobacterium tumefaciens* by 66% at 1000ppm without any lethal activity against the bacterial agent.(A.N.M. Alamgir, Minhajur Rahman, 2014)

d. Antibacterial

In vitro antibacterial activity of leaves and stem extracts of *Coccinia grandis* L., has been investigated against *Bacillus cereus*, *Corynebacterium diphtheriae*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli* (ETEC), *Klebsiella pneumonia*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella typhi* and *Shigella boydii*. Water extract of leaves and ethanolic extract of stem showed significant activity against *Shigella boydii* and *Pseudomonas aeruginosa* respectively.(Umbreen Farrukh, Huma Shareef & Rizwani, 2008). Evaluated the aqueous extract of leaves of *Coccinia grandis* for antibacterial activity against *Shigella flexneri* Niced, *Bacillus subtilis* *Escherichia coli*, *Salmonella choleraesuis*, *Shigella dysenteries*, and *Shigella flexneri*, Aqueous extract of *Coccinia grandis* showed more

significant antibacterial activity in comparison to ethanol extract. A polar moiety of the extract is more responsible for antibacterial properties. (Bhattacharya *et al.*, 2010). The chloroform extract of *Coccinia cordifolia* moderately active against *Sarcina lutea*, *Bacillus subtilis*. Ethyl acetate extracts active against *Staphylococcus aureus*. Hexane extract active against the *Sarcina lutea*, *Pseudomonas aeruginosa* (Tamilselvan N, Thirumalai T, Elumalai EK, Balaji R, 2011). Evaluated the antibacterial activity of *Coccinia grandis* leaf extract with solvents such as acetone, ethanol, methanol, aqueous and hexane against five bacterial species. Ethanol leaf extract of *Coccinia grandis* showed high antibacterial activity against *S. pneumoniae*, *E. Coli*, *B. Ceres*, *K. pneumoniae* and *S. aureus* (Sivaraj *et al.*, 2011)

e. Anthelmintic

Methanolic extract of *Coccinia grandis* possess the anthelmintic activity. The study revealed the worm *Pheretima posthuma* were used for this study. Different concentrations of the extract are used. Methanolic extract of *Coccinia grandis* acts through paralyzing the worm. The activity is measured by the time taken to paralyzing the worm and death (Tamilselvan N, Thirumalai T, Elumalai EK, Balaji R, 2011). Evaluation of Anthelmintic Activity of Crude Extracts of *Diospyros peregrina*, *Coccinia grandis* and *Schima wallichii*. The extracts caused paralysis followed by death of all selected worms at the selected concentrations. (Dewanjee *et al.*, 2007)

f. Antioxidant

Evaluated Ethanol extract of root of *Coccinia grandis* contain flavonoids which are responsible for antioxidant activity. Methanol extracts of the fruit of *Coccinia grandis* possess the potent antioxidant activity. The methanol extract of *Coccinia grandis* contains glycoside and flavonoid. The antioxidant activity of *Coccinia grandis* is due to the reducing power ability, hydrogen peroxide scavenging potential (Moideen., 2011). In vitro antioxidant activity of methanolic fruits extract of *Coccinia grandis* (Sundaram Ravikumar, Samuel Jacob Inbaneson, 2017). Antioxidant, antiglycation and insulinotropic properties of *Coccinia grandis* (L.) in vitro: Possible role in prevention of diabetic complications it can be concluded that the *Coccinia grandis* mature unripe fruit extract possesses profound antioxidant, antiglycation, insulin secretory activities. (Meenatchi, Purushothaman and Maneemegalai, 2016). Ethanol and methanol extract shows the antioxidant activity (Ashwini *et al.*, 2012). *Coccinia grandis* stem extract containing solvent petroleum, chloroform and ethyl acetate shows antioxidant activity. Ethyl acetate possess potent antioxidant activity than petroleum

(Deshpande, Patil and Daswadkar, 2011). *In vitro* Antioxidant Activity of *Coccinia Grandis* Root Extracts (Bhadauria *et al.*, 2012). Antioxidant effects of *Coccinia grandis* (Linn.) Voigt leaves on Aspirin-induced gastric ulcer in rats Methanol extract at an equivalent dose to that of the powder also showed a significant decrease in ulcer index with significant changes in mucus secretion, LPO and SOD. However, aqueous extract was found to be non-significant in reducing ulcer index. The group, receiving standard drug Famotidine, showed no effect on the mucus secretion induced in this experimental model. These observations confirm the antiulcerogenic potential of this plant, probably due to increased mucus secretion and antioxidant property. (Papiya Mitra Mazumdar *et al.*, 2008). *In vitro* antioxidant and anti-inflammatory activity of *coccinia grandis*. Antioxidant activities of different fractions from different extracts were evaluated by using *InVitro* antioxidant assay models like phosphomolybdenum and reducing power assay. The result obtained by this study *C.grandis* has potent antioxidant activity. (Ashwini *et al.*, 2012). A study of antioxidant activity of fruit extracts of *Coccinia grandis*. The antioxidant activity of the fruit has been evaluated by using three *in vitro* assays and was compared to standard antioxidant, Butylated hydroxyanisole (BHA). The results obtained in the present study indicate that the fruit of *Coccinia grandis* is a potential source of natural antioxidant. (Deshpande, Patil, Parmar, *et al.*, 2011). *In vitro* antioxidant activities of the fractions of *coccinia grandis* Leaf Extract. The antioxidant activities of the fractions have been evaluated by using nine *in vitro* assays and were compared to standard antioxidants such as ascorbic acid, α tocopherol, and curcumin and butylated hydroxyl toluene (BHT). All the fractions showed effective H donor activity, reducing power, free radical scavenging activity, metal chelating ability and inhibition of β -carotene bleaching. None of the fractions exerted an obvious pro-oxidant activity. The antioxidant property depends upon concentration and increased with increasing amount of the fractions.(Chatterjee, 2008). *In vitro* antioxidant profile of alcoholic extract of *Coccinia grandis* leaves(Sundaram Ravikumar, Samuel Jacob Inbaneson, 2017)

g. Antimalarial

Extract of *Coccinia grandis* shows excellent antiplasmodial activity against the *Plasmodium falciparum* (Sundaram Ravikumar, Samuel Jacob Inbaneson, 2017). Aqueous leaf extract of *Coccinia grandis* decreases the SGPT, SGOT, ALP, total protein, blood urea nitrogen concentration (Samanta *et al.*, 2011). The Larvicidal activity of *Coccinia grandis* in which methanolic extract of *Coccinia grandis* is used (Rahumann, 2008).

h. Anti-inflammatory

Evaluated the aqueous extracts of *Coccinia grandis* leaves and stem for the anti-inflammatory activity against formaldehyde-induced paw edema in rats (Deshpande, Patil, Daswadkar, *et al.*, 2011). Formaldehyde induced inflammation results production of endogenous mediators, such as; histamine, serotonin, prostaglandins, and bradykinin treated with *Coccinia grandis* extract (Bernard *et al.*, 1998). In vitro Anti-oxidant and Anti-inflammatory activity of *Coccinia grandis* (Ashwini. M., 2012)

i. Antipyretic

Evaluated methanolic extract of *Coccinia grandis* for antipyretic activity (Aggarwal, 2011)

j. Analgesic

Tail immersion and Hot plate models were used to evaluate the analgesic activity. Acetic acid induced analgesia is treated by using a methanol extract of *Coccinia grandis* (Aggarwal *et al.*, 2011).

k. Hypoglycemic

Hypoglycemic activity in *C.indica* (Cucurbitacea) leaves In anti-diabetic potential, effect of aqueous and cold extracts of *Coccinia Indica* (Cucurbitaceae) leaves on fasting blood sugar levels and serum biochemical analysis in streptozotocin induced diabetic rats was investigated. All the extracts of *Coccinia Indica* produced a significant anti diabetic activity at dose levels of 1/5th of their lethal doses.(Ajay, 2009). Evaluated Combined extracts of *Musa paradisiaca* and *Coccinia indica* aqueous extract of leaf for antidiabetic activity in streptozotocin induced diabetes rats (Mallick (2007). Chronic administration of fruit extract 200 mg/kg for 14 days reduces the blood glucose level in alloxan induced diabetic rat (Gunjan *et al.*, 2010). Ethanolic extract shows the decreased blood glucose level (Ramakrishnan *et al.*, 2011). Alcoholic extract of *Coccinia grandis* leaves (Eliza Jose, 2010) And stem have the capacity to lower the blood glucose level in normal fasted rats (Doss *et al.*, 2008). Ethyl acetate extract and petroleum ether extract of *Coccinia* contains triterpenes, alkaloid, flavonoid, B-carotene which is responsible for the hypoglycemic activity (Ariful Islam *et al.*, 2011). Anti-hyperglycaemic and Insulin Release Effects of *Coccinia grandis* (L.) Voigt Leaves in Normal and Alloxan Diabetic Rats (Doss *et al.*, 2008). In Vitro Antioxidant Profile of Alcoholic extracts of *Coccinia grandis* leaves Antidiabetic and Antioxidant Activities of Decoctions of *Coccinia grandis* Linn. And *Centella asiatica* (L.) on Alloxan-induced Diabetic rats (Siddiqui Islam *et al.*, 2014). Blood Sugar Lowering Effect of

Coccinia grandis (L.) J. Voigt: Path for a New Drug for Diabetes Mellitus. Assessed the efficacy of *Coccinia grandis* leaves as a hypoglycemic agent. *Methods*. Double-blind phase I clinical trial was conducted at the general hospital and a private hospital in Matara. *Coccinia grandis* has a blood sugar lowering effect. (Munasinghe *et al.*, 2011)

l. Antifungal

Evaluated the antifungal activity of the *Coccinia grandis* leaves extract against the *Candida albicans*-II, *Candida tropicalis*, *Aspergillus Niger*, *Saccharomyces cerevisiae*, *Candida tropicalis* II, *Cryptococcus neoformans* and *Candida albicans* ATCC (Bhattacharya *et al.*, 2010).

m. Hepatoprotective

Evaluated the alcoholic extract of the fruit of *Coccinia grandis* for Hepatoprotective activity against CCl₄- induced Hepatotoxicity in experimental rats (Vadivu., 2008). Hepatoprotective activity of *Coccinia grandis* leaves Against Carbon Tetrachloride Induced Hepatic injury rats (Sunilson, et al 2009). Evaluation of Hepatoprotective Activity of the Fruits of *Coccinia grandis* Linn. (Kumar *et al.*, 2009)

n. Antidyslipidemic

Evaluated chloroform extract of *Coccinia grandis* leaves for antidyslipidemic activity by lowering the triglycerides and cholesterol level in hamsters (Singha., 2007). Aqueous and ethanolic extracts of leaves can be used for control of obesity (Mishra *et al.*, 2012). Ivy gourd (*Coccinia grandis* L. Voigt) root suppresses adipocyte differentiation in 3T3- L1 cells (Ruthaiwan et al., 2014)

CONCLUSION

The literature survey revealed that *Coccinia grandis* has been widely studied for its pharmacological activities, chemical composition and medicinal uses. *Coccinia grandis* has been used in traditional medicine as a household remedy for various diseases. It can be concluded that *Coccinia grandis* is an important source of many pharmacological and medicinally important chemicals. Plant extracts have significant analgesic, antipyretic, anti-inflammatory, antimicrobial, Antiulcer, antidiabetic, antioxidant, hypoglycemic, hepatoprotective, antimalarial, antidyslipidemic, anticancer and mutagenic activity in different animal models. *C. grandis* could have beneficial effect for food and/or nutritious

application in the promotion of health. From this study, it is clear that the medicinal plants play a fundamental role against various diseases.

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