Pharmacological Activities of Coccinia Grandis: Review

School of Pharmacy, Swami Ramanand Teerth Marathwada University, Nanded-431606, Maharashtra, India.

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**ABSTRACT**

Many traditional medicines in use are obtained from medicinal plants, minerals and organic matter. During the past several years, there has been increasing interest among the uses of various medicinal plants from the traditional system of medicine for the treatment of different ailments. Coccinia grandis 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, antidyssipidemic, anticancer, antitussive, mutagenic. The present review gives botany, chemical constituents and pharmacological activities of coccinia grandis.

**INTRODUCTION**

A vast majority of the population, particularly those living in rural areas depends largely on medicinal plants for treatment of diseases. There are about 7000 plant species found in India. The WHO estimates that about 80% of the population living in the developing countries rely almost on traditional medicine for their primary health care needs. Plants have played a significant role in maintaining human health and improving the quality of human life (Tamilselvan et al, 2011).

The Cucurbitaceae family is commonly known as gourd, melon and pumpkin family. The family of Coccinia grandis is Cucurbitaceous, comprises 960 species. The family is predominantly distributed around the tropics. Most of the plants in Cucurbitaceae family are annual vines (Reddy, 2009). Coccinia includes 29 additional species and they are found only in tropical Africa. Coccinia grandis is used by humans mostly as a food crop in several countries in Australia, Asia, Caribbean, and the southern United States, Pacific Islands. Coccinia grandis hosts several insects such as Leptoglossus Australis, Aphis gossypii Glover, Diaphania indica, Bactrocera cucurbitae, Liriomyza spp., Aulacophora spp., that attack several commercially important species of the Cucurbitaceous (Bamba et al, 2009). Chemical and mechanical methods of control proved to be unproductive, uneconomical, unacceptable, and unsustainable (Muniappan et al., 2009).

**BOTANY**

Coccinia grandis is a fast-growing perennial vine that grows several meters long. It can form dense mats on lands that readily cover shrubs and small trees.

**Leaves**

Its leaves are arranged alternately along the stems; the shape of the leaves varies from heart to pentagon shaped. (Up to 10 cm wide and long). The upper surface of the leaf is hairless, whereas the lower is hairy. There are 3–8 glands on the blade near the leaf stalk. Tendrils are simple. Coccinia grandis is dioecious.

**Flower**

Flowers are large, white and star-shaped. The calyx has five subulate, recurved lobes, each 2–5 mm long on the hypanthium; peduncle 1–5 cm long. The corolla is white, campanulate, 3–4.5 cm long, deeply divided into five ovate lobes. Each flower has three stamens. The ovary of Coccinia grandis flower is inferior.
Staminate flowers solitary, rarely in axillary clusters of 2-3, pedicels 15-50 mm long, lobes of calyx is subulate, recurved, 2-5 mm long, corolla lobes ovate, white, long about 15-20 mm; pistillate flowers solitary on stalks 10-30 mm long, hypanthium 10-15 mm long (Starr et al., 2003).

Fruit
The fruit is red, ovoid to elliptical, 25–60 mm long, 15–35 mm in diameter, glabrous, hairless on stalks.

Seeds
6-7 mm long, tan-colored, margins thickened.

Root
The roots and stems are succulent, tuberous and most likely facilitate the plant to survive prolonged drought. Desperations of Coccinia grandis are by the humans. Also spread by birds and other animals, pigs, moved unintentionally on equipment or on wood and germinate where they land. Hybridization and clonal selection are one of the viable methods to develop improved Clone in ivy gour (Sureshbabu et al., 2001; Maurice et al., 2012; Ajmal Ali et al., 2005-2006).

Fig 1: Coccinia grandis.

Vernacular Names (Ajmal Ali et al., 2005)

<table>
<thead>
<tr>
<th>Vernacular Name</th>
<th>Marathi</th>
<th>Hindi</th>
<th>English</th>
<th>Malayalam</th>
<th>Japanese</th>
<th>Malay</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>Tindora, Tondli</td>
<td>Parval, Tindora, Tinda, Kundru</td>
<td>Scarlet</td>
<td>Donidakaya</td>
<td>Yasai, karasuri</td>
<td>Pepasu, Kovakka, Kovai</td>
<td>Pepino, cimaron</td>
</tr>
</tbody>
</table>

Synonyms
Coccinia indica Wight and Arn, Bryonia grandis and Coccinia cordifolia auct

CHEMICAL CONSTITUENTS
Root - Resin, Alkaloids, Starch, Fatty Acids, Carbonic acid, Triterpenoid, Saponin Coccinoside, Flavonoid Glycoside, Lupeol, β-amyrin, β-sitosterol, Taraxerol (Deokate et al., 2011).

MEDICINAL VALUE OF VARIOUS PARTS OF COCCINIA GRANDIS

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Medicinal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td>Antidiabetic, oxidant, larvicidal, GI disturbances, Cooling effect to the eye, Gonorrhoea, hypolipidemic, skin diseases, urinary tract infection.</td>
</tr>
<tr>
<td>Fruit</td>
<td>Hypoglycemic, analgesic, antipyretic, Hepatoprotective, tuberculosis, eczema, anti-inflammatory.</td>
</tr>
<tr>
<td>Stem</td>
<td>Expectorant, antispasmodic, asthma, bronchitis, GIT disturbances, urinary tract infection, skin diseases, Hypoglycemic, antidiabetic, skin diseases, removes pain in joint, urinary tract infection.</td>
</tr>
<tr>
<td>Root</td>
<td></td>
</tr>
</tbody>
</table>

PHARMACOLOGICAL ACTIVITIES

Antibacterial
Bhattacharya et al., (2010) evaluated the aqueous extract of leaves of Coccinia grandis for antibacterial activity against Shigella flexneri NICE, Bacillus subtilis Escherichia coli, Salmonella choleraesuis, Shigella dysenteriae, 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. The chloroform extract of Coccinia cordifolia moderately active against Sarcina lutea, Bacillus subtilis. Ethyl acetate extracts active against staphylococcus aurous. Hexane extract active against the sarcina lutea, Pseudomonas aeruginosa (Bulbul et al., 2011). Sivaraj et al (2011) evaluated the antibiotic activity of Coccinia grandis leaf extract with solvents
such as acetone, ethanol, methanol, aqueous and hexane against five bacterial species. Ethanolic leaf extract of Coccinia grandis showed high antibacterial activity against S. pigeons, E. Coli, B. Ceres, K. pneumonia and S. aureus (Sivaraj et al., 2011). Antibacterial activity of Coccinia grandis extract tested against the six gram positive and gram negative bacteria, ethanol extract of stem active against all except Klebsiella p and Proteus mirabilis. Hexane extract moderately active against all gram positive and gram negative bacteria except Proteus mirabilis. Ethyl acetate extracts moderately antibacterial against all except Proteus mirabilis and staphylococcus aeruginosa (Farukh et al., 2008 ;Tamilselvan et al., 2011).

**Anthelmintic**

Methanolic extract of Coccinia grandis posses the anthelmintic activity. The worm pheretime posthuma were used for Anthelmintic activity. 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 et al., 2011 ).

**Antioxidant**

Moideen (2011) evaluated Ethanol extract of root of Coccinia grandis contain flavonoids which are responsible for antioxidant activity. Methanol extracts of the fruit of Coccinia grandis posses 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 (Deshpande et al., 2011; Mongkolsilp et al., 2004) 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 et al., 2011) Coccinia grandis methanol extract and leaf powder contain the antioxidant principle (Mujumder et al., 2008)

**Antilulcer**

The anti-ulcer activity aqueous extract of leaves of Coccinia grandis was investigated in pylorus ligation and ethanol induced ulcer models in experimental rats. Ulcer index was determined in both models. 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 showed significant reduction in ulcer index, free acidity and gastric (Girish et al., 2011)

Manoharan (2010) evaluated the Ethanol, aqueous and total aqueous extract for antilulcer activity in pylorus ligation induced gastric ulcer. Ethanolic extract showed the antisecretory mechanism for their anti ulcerogenic activity. Ethanolic extract of plant extract at 400 mg/kg exhibited anti ulcerogenic activity as that of omeprazole.

**Antimalarial**

Extract of Coccinia grandis shows excellent antiplasmodial activity against the Plasmodium falciparum (Sundaram et al., 2012). Aqueous leaf extract of Coccinia grandis decreases the SGPT, SGOT, ALP, total protein, blood urea nitrogen concentration. Hydrophilic moiety of Coccinia grandis extract is responsible for antimalarial activity. The extract reduces the significantly the Plasmodium berghei parasite count in mice (Samanta et al., 2011). The Larvicidal activity of Coccinia grandis in which methanolic extract of Coccinia grandis is used (Rahumann., 2008).

**Anti inflammatory**

Deshpande (2011) evaluated the aqueous extracts of Coccinia grandis leaves and stem for the anti-inflammatory activity against formaldehyde-induced paw edema in rats. The formaldehyde causes the cell damage and which provokes the production of histamine, prostagrandins bradykikin and serotonin. Aqueous extract of leaves showed more significant percentage inhibition of paw edema than the aqueous extract of the stem and standard, used as indomethacin. Formaldehyde induced inflammation results production of endogenous mediators, such as; histamine, serotonin, prostaglandins, and bradykinin treated with Coccinia grandis extract (Bernard et al., 1998).

**Antipyretic**

Aggarwal (2011) evaluated methanolic extract of Coccinia grandis for antipyretic activity at the doses of 100 and 200 mg/kg in yeast-induced fever. The extract showed antipyretic activity by influencing the prostaglandin biosynthesis. Prostaglandin is considered as a regulator of body temperature. Coccinia grandis extract contains glycosides, alkaloids, flavonoid, terpenoids, phenols and tannins.

**Analgesic**

Acetic acid induced writhing. 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. A Methanolic extract of the leaves of Coccinia grandis revealed the presence of glycosides, alkaloids, flavonoid, terpenoids, phenols and tannins. Analgesic action of the active compound(s) in the methanol extract of Coccinia grandis May be mediated through peripheral but not central mechanism. Coccinia grandis reduce the complications produced by acetic acid (Aggarwal et al., 2011).

**Hypoglycemic**

Mallick (2007) evaluated Combined extracts of Musa paradisica and Coccinia indica aqueous extract of leaf for antidiabetic activity in streptozotocin induced diabetes rats. The ethanolic extract of the aerial part decreases blood glucose levels and lipid parameters in streptozotocin induced diabetic rats at 100 or 200 mg/kg. Chronic administration of fruit extract 200 mg/kg for 14 days reduces the blood glucose level in alloxan induced
dianalized the aqueous extract of leaves of Coccinia indica reduced the blood glucose level; also reduced the cholesterol, protein and urea with prolonged treatment. Coccinia grandis stimulated gluconeogenesis, or inhibited glycogenolysis in the diabetic rat liver. Treatment with Coccinia extract increases the total protein, SGPT, SGOT (Doss et al., 2008). The Coccinia indica leaves extract exerts hypoglycemic activity on blood glucose and cholesterol, TG, LDL, VLDL level in alloxan induced diabetic rats (Manjula et al., 2007). The hypoglycemic activity of Coccinia grandis fruit evaluated by using alloxan induced diabetic rat. Ethanolic extract shows the decreased blood glucose level. Pectin from fruit reduces the blood glucose by decreasing the absorption of glucose from the intestine and increasing liver glycogen and decreasing glycogen phosphorylase (Ramakrishnan et al., 2011). Combined Methanolic extract of leaves of Coccinia indica and salvadora oleoides shows the hypoglycemic activity (Saklanil et al., 2012). 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 triterpines, alkaloid, flavonoid, B-carotene which is responsible for the hypoglycemic activity (Ariful Islam et al., 2011).

Antifungal
Bhattacharya (2010) 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. Ethanol extract is more significant in producing antifungal activities. Nonpolar fractions in the extract possess a higher level of antifungal properties. Aqueous extract is more sensitive for both strains of Candida albicans and Ethanolic extract is more sensitive for Aspergillus Niger and both strains of Candida albicans (Bhattacharya et al., 2010).

Hepatoprotective
Vadivu (2008) evaluated the alcoholic extract of the fruit of coccinia grandis for Hepatoprotective activity against CCl4-induced Hepatotoxicity in experimental rats, Treatment with 250 mg/kg ethanolic extract of fruit significantly reduced the SGPT, SGOT and bilirubin level. Hepatoprotective activity of the extract may be due to the antioxidant effects of flavonoid found to be present in the fruits. Flavonoids, triterpens and tannin were antioxidant agent present in coccinia grandis and may interfere with free radical formation confirmed that Hepatoprotective activities of certain flavonoids are known. (Vinodkumar et al.,2009; Anil Kumar et al., 2012; DR. Krishnkumari et al., 2011;Sunilson., et al 2009).

Antidyslipidemic
Singha (2007) evaluated chloroform extract of Coccinia grandis leaves for antidyslipidemic activity by lowering the triglycerides and cholesterol level in hamsters. Chloroform extract of Coccinia grandis leaves containing polypropen, lowers the plasma lipid profile then increasing high density lipid cholesterol and total cholesterol ratio. C60-polyprenol isolated first time from this plant. It drastically decreased serum triglycerides by 42%, total cholesterol 25% and glyceral 12%, in high fat diet feed dyslipidemic hamsters at the dose of 50 mg/kg body weight. Aqueous and ethanolic extracts of leaves can be used for control of obesity (Mishra et al., 2012).

Anticancer
There are a number of vegetables occurred to reduce the risk of cancer. One of them is Coccinia grandis. The anticancer activity of the Coccinia grandis is due to the antioxidant nature. The antioxidant nature of Coccinia grandis reduces the ferrocynaide to ferrous. Hydrogen peroxide scavenged from Coccinia grandis neutralizes to water (Behera et al., 2012). Bhattacharya (2011) evaluated the aqueous extract of leaves of coccinia grandis for anticancer activity. Nitric oxide is a free radical which acting an important role in the pathogenesis of pain, inflammation. The antioxidant principle of Coccinia grandis decreases the nitrite generated by decomposition. Graded response produced by the cell is comparatively less. Coccinia grandis significantly reduced viable cell count and increased non viable cell count suggesting comparable anticancer property with that of the reference drug (vinblastine) (Nanasombat et al., 2009; Bhattacharya et al., 2011).

Antitussive
Pattanayak (2009) evaluated the methanol extracts of the fruit of coccinia grandis for analgesic activity. Coccinia grandis has extensively used to get relief from asthma and cough by the indigenous people of India. The methanol extracts of the fruit of Coccinia grandis show the presence of alkaid, tannin, steroid, triterpenoid, glycoside, carbohydrates and reducing sugar. The Antitussive activity of methanol extract has been compared with that of codeine (Antitussive drug). The methanol extract of Coccinia grandis fruit showed the significant decrease in cough induced by the chemical simulation similar to codeine phosphate in a dose dependant manner. The methanol extract produces maximum inhibition of cough at 90 min. The highest inhibition of cough (56.71%) was produced by the extract of the 400 mg/kg dose level at 90 min. The methanol extract act through the central nervous system.

Mutagenic effect
Aqueous extract of leaves of Coccinia grandis showed inhibition of growth and mutagenesis on Neurospora crassa by a gradual decrease of growth of mycelia. This result indicates that Coccinia grandis plant shows mutagenic effect on Neurospora crassa. (Bhuiyan et al., 2009).

Alpha-amylase inhibition
Jaiboob (2011) evaluated the methanolic extract of Coccinia grandis for alpha amyrase inhibitory activity. The dried plant material extracted with 50% aqueous methanol (10 ml/g dry
wt.) and redissolved in 50% aqueous DMSO (10 ml/g dry wt.) and subjected to alpha-amylase inhibitory activity. The Coccinia grandidis showed the 81.13% of alpha amylase inhibitory activity.

CONCLUSION

The literature survey revealed that Coccinia grandidis has been widely studied for its pharmacological activities and regarded as Universal Panacea in Ayurvedic medicines. It can be concluded that Coccinia grandidis is an important source of many pharmacological and medicinally important chemicals. From this study, it is clear that the medicinal plants play a fundamental role against various diseases. Plant extracts have significant analgesic, antipyretic, anti-inflammatory, antimicrobial, Antiulcer, antidiabetic, antioxidant, hypoglycemic, hepatoprotective, antimalarial, antidyshlipidemic, anticancer, antitussive, mutagenic activity in different animal models.

REFERENCES


Rahumann A A., venkatesan larvicidal efficacy of five plant leaf extract against mosquito species. journal of paracitol research. 2008; 103: 133-139.


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