Review Article

A Compendious Write-Up on *Coccinia grandis*

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ABSTRACT

Healing with medicinal herbs is as old as humankind itself. They provide holistic care as well as well-being through prophylactic treatment and rejuvenation. The present society of diseases requires an ultimate drug that gives an utmost cure, no reoccurrences, no adverse effects, and better health. One among these ethno medicinally important plants that is well known in the traditional system of medicine is *Coccinia grandis* of the family Cucurbitaceae. It is a dioecious, perennial and herbaceous climber or trailing vine with glabrous stems and tuberous roots. Traditionally different parts of the plant namely the roots, leaves, and fruits are used in folklore medicine for various purposes. The existence of the secondary metabolites like alkaloids, flavonoids, saponins, glycosides etc. in the plant may contribute to their medicinal value. In view of the immense medicinal value of the plant, this review is an effort to compile all the information reported on its ethnobotanical, phytochemical and pharmacological activities. Also, this work attempts to generate interests regarding its potential in preventing and treating several common diseases. Many pharmacological studies have reported the ability of this plant to exhibit analgesic, antipyretic, anti-inflammatory, antimicrobial, antiulcer, antidiabetic, antioxidant, hypoglycemic, hepatoprotective, antidyslipidemic, anticancer, antitussive activities.

Keywords: Prophylactic, rejuvenation, *Coccinia grandis,* Cucurbitaceae, secondary metabolites, pharmacological activities.

INTRODUCTION

Plants are a boon to the life kind given by God.[1] Herbal drugs are having many advantages over the synthetic formulations with a longer pharmacological effect and lesser metabolic toxicity.[2] In India, the use of the different parts of medicinal plants to cure specific ailments has been in practice from ancient times. The indigenous systems of medicine, like the Ayurveda, Siddha, and Unani, are in existence for several centuries. It is estimated that around 70,000 plant species are being used for various medicinal purposes. India recognizes more than 2,500 plant species with medicinal value, Srilanka 1,400 and Nepal around 700. 40% of doctors especially in India and China have advised the increasing use of indigenous drugs and natural medicines. The World Health Organization (WHO) estimates that about 80 % of the population in the developing countries rely almost exclusively on traditional medicines for their health care needs.[3] As per the present scenario, people mostly requires a type of medicine which does not show any kind of adverse effects. This could only be made possible by the traditional plant medicines that are having a complete positive activity towards persons and complete pharmacological activity towards the diseases. [1]

Coccinia grandis belongs to family Cucurbitaceae, commonly known as Ivy gourd or little gourd also known as baby watermelon, gentleman's toes, and locally known as Kundru, is a tropical plant. It is native to Bengal and other parts of India.[4] *Coccinia grandis* grows abundantly all over India, tropical Africa, Australia, and throughout other oriental countries. The plant has also been used tremendously in Ayurvedic and Unani practice in the Indian subcontinent.[5] Every part of the plant is beneficial in medicine and also in various preparations that have been mentioned in the indigenous system of medicine like the anti-inflammatory, analgesic and antipyretic activity of fruit and leaves have been studied so far and are found to be noteworthy.[5,6] The plant contains secondary metabolites such as saponins, flavonoids, sterols, and alkaloids.[5] The whole plant can be traditionally used for various curative purposes.[7] Leaves are used in Indian traditional medicine for treatment of a number of maladies including diabetes, wounds, ulcers, inflammation, in eruptions of the skin, fever, asthma, and cough. Prior scientific investigations of *coccinia grandis* showed that the crude plant extract has hepatoprotective, antioxidant, anti-inflammatory and anti-nociceptive, anti-diabetic, hypolipidemic, anti-bacterial, and anti-tussive activities.[5]

Morphological characters

Synonyms

Coccinia cordifolia, Coccinia indica, Cephalandra indica, Physedra, Staphylosyce.[5,8]

Taxonomy

Table 1: Botanical Classification of *Coccinia grandis*.[5]

Kingdom	:	Plantae
Order	:	Cucurbitales
Family	:	Cucurbitaceae
Sub family	:	Cucurbitoideae
Tribe	:	Benincaseae
Sub tribe	:	Benincasinae
Genus	:	Coccinia Wight & Arn.
Species	:	*Coccinia indica*

Vernacular names

Table 2: Vernacular names of *Coccinia grandis.*[3,5,9]

Sanskrit	: Tundika
Assam	: Kawabhaturi
Bengal	: Bimbu
English	: Ivy-gourd
Hindi	: Kundaru ki bel, Kundru
Punjab	: Kanduri
Tamil	: Kovai
Urdu	: Kunduru
Gujrat	: Ghilodi
Oriya	: Parwal, Kundru, Tondi
Malayalam	: Tendli (Konkani), Ghiloda, Kundri, Kowai, Kovai, Kovakkai

Distribution

Coccinia grandis (Ivy gourd) is occasionally cultivated as a garden vegetable in the tropical and sub-tropical regions of the world. It is believed to be native to central Africa, India, and Asia. Its long history of usage, cultivation, and transportation by people has obscured its base. It is a common weed in South-East Asia. It has been naturalized in Texas (US), Florida (US), Hawaii (US), the Philippines, the Caribbean, Papua, and New Guinea, Vanuatu, Fiji, Guam, Marshall Islands, and the Solomon Islands. It is considered a valuable wild vegetable by the indigenous people of southeast Asia and India.[10,11]

Botanical description

Coccinia grandis is a perennial, glabrous, climbing herb or trailing vine with glabrous stems and tuberous roots. It is a fast-growing perennial vine that grows several meters long. It can form dense mats that readily cover the shrubs and small trees. Its leaves (**Figure 1**) are arranged alternately along the stems; they vary from heart to pentagon shape and are up to 10 cm wide and long. The upper surface of the leaf is hairless, whereas the lower surface is hairy. There are about 3–8 glands on the blade near the leaf stalk. Tendrils are simple. The plant is dioecious (male flowers are produced on separate plants to female flowers). Flowers (**Figure 2**) are large, white and star-shaped. The calyx has got five subulate, recurved lobes, each 2–5 mm long on the hypanthium; and the peduncle is 1–5 cm long. The corolla is campanulate, of white color, 3–4.5 cm long, and is well divided into five ovate lobes. Each flower has got three stamens (present as staminodes in female flowers). The ovary is inferior. The fruit (**Figure 3**) becomes red (when ripe), ovoid to elliptical, 25–60 mm long, 15–35 mm in diameter, and hairless on stalks 10–40 mm long. Seeds are tan-colored and 6 –7 mm long. The roots and stems are succulent and possibly enables the plant to survive prolonged drought.[9,11]

Figure 1: Leaf

Figure 2: Flower

Figure 3: Fruit

Nutrient composition

Table 3: Nutrient composition of *Coccinia grandis*.[6]

Carbohydrate	12.62%
Total protein	15%
Water-soluble protein	11.25%
Lipid	4.00%
Total Phenol	61.92mg/100g
Vitamin C	25.55 mg/100g
β-Carotene	70.05mg/100g
Potassium	3.3 mg/100g
Phosphorous	1.15 mg/100g
Sodium	0.95mg/100g
Iron	2.23 mg/100g
Calcium	3.79mg/100 g

Chemical constituents

The plant contains resins, alkaloids, fatty acids, flavonoids and proteins as chief chemical constituents. Aspartic acid, Glutamic Acid, Asparagine, Tyrosine, Histidine, Phenylalanine, Threonine, Valine, and Arginine are also found. The methanolic extract of fruit contains alkaloids, steroids, tannins, saponins, ellagic acid, phenols, glycosides, lignans, and triterpenoids. Roots contain Triterpenoid, saponin coccinioside, Flavonoid glycoside ombuin 3-o- arabino furanoside, Lupeol, β-amyrin, and β-sitosterol and Stigmast -7- en-3-one.[4]

It contains many chemical constituents in every of its part. They include:

I. Aerial part:- Heptacosane, Cephalandrol, β -sitosterol, Alkaloids Cephalandrins A and B.

II. Fruits:- β- Amyrin Acetate, Lupeol, Cucurbitacin B, Taraxerone, Taraxerol, β-carotene, Lycopene, Cryptoxanthin, Xyloglucan, Carotenoids, β-sitosterol, Stigma-7-en-3one.

III. Root: - Resin, Alkaloids, Starch, Fatty Acids, Carbonic acid, Triterpenoid, Saponin Coccinoside, Flavonoid Glycoside, Lupeol, β-amyrin, β- sitosterol, Taraxerol.[1,12]

Medicinal uses of different parts

1. Leaf

Antidiabetic, antioxidant, larvicidal, GI disturbances, cooling effect to the eye, gonorrhoea, hypolipidemic, skin diseases, urinary tract infection.

2. Fruit

Hypoglycemic, analgesic, antipyretic, hepatoprotective, tuberculosis, eczema and anti-inflammatory.

3. Stem

Antispasmodic effect, expectorant, useful in Asthma, and bronchitis, cure diabetes and intermittent glycosuria, gastrointestinal disturbances and diseases, Skin diseases, Urinary tract infection, and related troubles.

4. Root

Remove pain in joints, aphthous ulcers, wheezing, and phlegm, cure diabetes, and intermittent glycosuria, Skin diseases, skin lesions (Tenia).[1]

Pharmacological activities

Anti-bacterial activity

Umbreen Farrukh et al., investigated the In vitro antibacterial activity of leaves and stem extracts of *Coccinia grandis* against gram-positive (Bacillus cereus, Corynebacterium diphtheriae, Staphylococcus aureus and Streptococcus pyogene and gram-negative (Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Salmonella typhi, and Shigella boydii). The study was carried out using the well-diffusion technique. Ampicillin and Amoxicillin were used as standard and nutrient agar was employed as the medium. The zone of inhibition of bacterial growth was measured and is compared with the control. Water extract of leaves and ethanol extract of the stem showed high activity against Shigella boydii and Pseudomonas aeruginosa equivalent to the reference drugs.[13]

Hepatoprotective Activity

Vadivu et al., evaluated the hepatoprotective activity of alcoholic extract of the fruits of *Coccinia grandis* using carbon tetrachloride (CCl4)- induced hepatotoxicity in rats. Male Wistar strain albino rats weighing 150 – 200 g and albino mice weighing 22 –25 g were used. 24 rats were taken for the study, divided into 4 groups of 6 animals. The levels of serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP), total protein, total and direct bilirubin were evaluated in experimental rats (with or without CCl4-induced hepatotoxicity) following administration of an alcoholic extract of the fruits of C. grandis using standard procedures. The potency of the extract was compared with the standard drug silymarin at a dose of 100 mg/kg p.o. Histopathology of the liver tissues treated with the extract was also studied. At a dose level of 250 mg/kg, the alcoholic extract significantly decreased the activities of serum enzymes (SGOT, SGPT, and ALP) and bilirubin which were comparable with that of silymarin.[14]

Anusha Bhaskar et al., studied on the Protective effect of *Coccinia grandis* fruit extract against (Diethylnitrosamine) DEN-induced Hepatotoxicity in Wistar Albino Rats. They were divided into 5 groups consisting of 6 rats in each group. An elevated level of the liver enzymes aspartate aminotransferase (AST), alanine aminotransferase (ALT), Alkaline phosphatase (ALP)and Alcohol dehydrogenases (ADH) were observed. Liver oxidative stress was confirmed by the elevation of lipid peroxidation that was measured as malondialdehyde (MDA), and a decrease in the enzymic and non-enzymic antioxidant activities. Oral administration of the methanolic fruit extract of Coccinia grandis for 30 days to DEN-treated rats significantly improved the antioxidant levels, reduced the oxidative stress and also caused a reversal of the liver parameters. The results obtained were comparable with that of the standard drug silymarin.[15]

Anti-Ulcer Activity

Thirupathi et al., carried out a study on the Antiulcer activity of ethanolic, aqueous and total aqueous extracts of *coccinia grandis* leaf in pyloric ligature-induced ulcers in albino rats. The ulcer was induced by pylorus ligature. Rats were divided into 8 groups with six each. Drugs were administered in two different dose levels (200mg/Kgbwt, and 400mg/ Kgbwt). All the three extracts of *Coccinia grandis*, dose-dependently reduced the total acidity, ulcer index, and increased pH of gastric juice, while the ethanol extract showed a remarkable result that is (78.57%), which shows a highly significant ulcer curative potential

and decreased ulcer formation also. Preliminary phytochemical analysis revealed the presence of different phytoconstituents such as alkaloids, carbohydrates, glycosides, phytosterol, saponins, volatile oil, tannins etc which may impart their antiulcer activity by acting as anti-secretory and cytoprotective agents. The present result suggests that both anti-secretory and cytoprotective mechanisms of different extracts of *Coccinia grandis* exerted a protective effect.[16]

Hansa Gupta et al., conducted a study on the Pharmacodynamic Interaction of *Coccinia Indica* leaf extract with Omeprazole in experimentally induced ulcers in rats. Gastric ulcers in Sprague Dawley rats were induced by Indomethacin (25mg/kg), Pylorus ligation model and Stress-induced Ulcer. Various parameters like Acidity, ulcer index, pepsin and mucin content, antioxidant parameters like superoxide dismutase (SOD) and Catalase were evaluated. Omeprazole (2mg/kg) was used as standard. *Coccinia indica* was administered at two dose levels of 200mg/kg and 400mg/kg. Oral administration of a combination of Omeprazole and Coccinia at 200 and 400mg/kg produced a marked decrease in acidity, ulcer index and severity of ulceration in the pylorus ligation model as well as considerable protection against stress and indomethacin-induced ulcerations compared to control. It also showed a particular decrease in pepsin content and a significant increase in mucin content as compared to the control in pylorus ligation model. In Indomethacin-induced model, combination therapy at high dose showed a notable increase in antioxidant parameters like SOD and catalase compared to the control. The anti-ulcer effects of the combination of Omeprazole and Coccinia at both dose levels were markedly higher than Omeprazole alone.[17]

Anti-oxidant activity

Tapan Kumar Chatterjee et al., investigated on the effect of the fractions of *Coccinia grandis* leaf extract on lipid peroxidation and antioxidant enzymes in oxonate-induced Hyperuricaemic mice. Swiss albino mice of either sex were used. They were divided into 7 groups consisting of six each. The petroleum ether, chloroform, ethyl acetate, and residual fractions of the hydromethanolic extract of the leaves of *coccinia grandis* at a dose of 200 mg/kg bw were given orally to the mice for 7 days. Potassium oxonate, was injected intraperitoneally (280 mg/ kg) to induce hyperuricemia. The end products of lipid peroxidation, Malondialdehyde (MDA) and lipid hydro peroxidases (LH) and the levels of tissue protein, enzymatic and nonenzymatic antioxidants were estimated in the liver. Allopurinol (10mg/kg) was used as the standard. Significant elevation was noted in MDA and LH and a decrease in total protein and antioxidant enzymes in hyperuricaemic mice compared to normal control. Among the fractions tested, the chloroform fraction demonstrated the highest activity followed by the petroleum ether and ethyl acetate fractions.[18]

Pavithra M.K.S., et al., evaluated the phytochemical and antioxidant potential of fruit and leaf extracts of *Coccinia grandis*. The antioxidant activity of the leaf and fruit extracts were qualitatively determined by DPPH scavenging assay. The ethanolic extracts of leaves and fruits of *C.grandis* were collected and subjected to phytochemical screening and comparative analysis. HPLC was done to quantify the compounds that are likely to be present in the extracts. Antioxidant activity of the extracts was also carried out in order to determine the free radical scavenging efficiency. The results of the phytochemical analysis showed that the terpenoids, reducing sugar, flavonoids, and proteins were present in significant quantity. The comparative analysis between the fruit and leaf extracts indicated that the fruit extract showed better antioxidant and phytochemical characteristics than the leaf extract.[19]

Anti-diabetic activity

Saikat Ghosh et al., evaluated the antidiabetic potential of methanolic extract of *Coccinia indica* leaves in streptozotocin (65 mg/ kg) i.p induced adult Wistar strain albino diabetic rats. Normoglycemic and Anti-hyperglycemic studies were conducted. 18 rats divided into three groups of six animals and each was subjected for Normoglycemic study. Group II and III, were given methanolic extract of C. indica (MECI) at concentrations of 150 and 300 mg/kg, by oral route. The glucose levels were found to be rising in the rats of the control group over a period of 12 hrs from treatment by 5.33% when compared to the results after 1 hr of treatment. In case of the MECI treated rats of Group II and III over the same period of time and upon a similar comparison, the glucose levels were found to have decreased by 27.58 and 26.24% respectively, whereas in Antihyperglycaemic Study: Hyperglycaemic animals were divided into four groups of six rats in each group. Group II and III were given methanolic extract of C. indica (MECI) at doses of 150 and 300 mg/kg body weight respectively by the oral route. Group IV animals were treated with a saline solution containing the standard drug Glibenclamide at a dose of 0.25 mg/kg body weight. When compared to the control group, the diabetic rats in Group II and III showed a reduction of 36.10% and 41.87% in the plasma glucose levels after 10 days of treatment with MECI while the rats in Group IV showed a decrease of 43.50% during the same period upon treatment with glibenclamide.[20]

Md. Shahid Sarwar et al., carried out the Comparative Evaluation of Antidiabetic Activity of Crude Methanolic Extract of Leaves, Fruits, Roots and Aerial Parts of *Coccinia grandis* in Albino mice (30-35 gm). The animals were randomly divided into 15 groups consisting of three mice in each group. Diabetes was induced by a single intraperitoneal injection of alloxan (150 mg/kg) in albino mice. Different groups of diabetic animals were treated with crude plant extract of 150 mg/kg, 300 mg/kg, 450 mg /kg respectively orally administered for a period of 8 hours. The blood sugar level was monitored after 2 hours,

after 4 hours, after 6 hours and after 8 hours respectively. The antidiabetic effect of crude plant extract was compared with Glibenclamide (10 mg/kg) belongs to the group of oral hypoglycemics. The leaf extract showed a % reduction of 35.85%, 33.88%, 62.93% and 62.92. Fruit extract showed a % reduction of 41.11%, 35.52%, 69.07% and 62.92%. In case of root extract the % reduction was found to be 74.11%, 40.7%, 46.71%, and 62.92% and of the aerial part extracts 22.03%, 49.67%, 65.78%, 62.92% were found to be the percentage reduction.[21]

Anti-tussive Activity

Shakti Prasad Pattanayak et al., studied the In vivo antitussive activity of *Coccinia grandis* fruit against irritant aerosol and sulfur dioxide-induced cough model in rodents. The experiments were carried out in male guinea pigs (400-450 g) and Swiss albino mice(30-40 g) of either sex. Guinea pigs, five in each group, and mice divided into five groups, each containing 10 mice were used for the study. The antitussive effect of aerosols of two different concentrations (2.5% and 5% w/v) with methanolic extract of *C. grandis* fruits were tested by counting the number of coughs produced due to aerosols of citric acid, 10 min after exposing the male guinea pigs to aerosols of the test solutions for about 7 minutes. In another set of experiment methanolic extract was investigated for its therapeutic efficacy on a cough model which is induced by sulfur dioxide gas in mice. The results showed a significant reduction of the cough number obtained in the presence of both concentrations of methanol extract as that of the prototype antitussive agent codeine phosphate. Also,the methanolic extract exhibited significant antitussive effect at 100, 200 and 400 mg/kg, per orally by inhibiting the cough by 20.57, 33.73 and 56.71% within 90 min of performing the experiment.[22]

Antihyperlipidemic Activity

Dewan Md. Sumsuzzman et al., studied the Antihyperlipidemic activity of *coccinia grandis* leaf extracts on high-fat diet induced Wistar albino rats. Male Wistar albino rats were divided into four groups: Groups I normal control; Group II HFD control; Group III HFD + C. grandis extract (2 mg/gm), Group IV HFD + Olive oil (2 mg/gm). The whole study lasted for about 5 weeks. Administration of HFD caused a significant increase in the serum total cholesterol (T.C), LDL-cholesterol, VLDL-cholesterol, triglycerides (T.G). Administration of ethanolic extract of *C. grandis* notably prevented the rise in serum total cholesterol, LDL-cholesterol, VLDL-cholesterol and triglycerides. A momentous decrease in body weight and an increase in HDL-cholesterol was observed in *C. grandis* extract treated rats.[23]

Nongporn HUTADILOK-TOWATANA et al. investigated the lipid-lowering Effects of Hexane fraction of Ivy Gourd root in mice fed with High-Fat Diet. In their previous study, the ethanolic extract of ivy gourd root exhibited anti-obesity action by potently inhibiting 3T3-L1 preadipocyte differentiation. But here they investigated the anti-obesity effects of the hexane fraction of ivy gourd root extract (IGH) in high-fat diet (HFD) induced obese mice and provide evidence on its underlying molecular mechanisms. C57BL/6J mice were fed with HFD in the presence or absence of 2 % (w/w) dietary concentration of IGH for about 4 weeks. Biochemical determinants of obesity were measured in these animals. Consumption of IGH had caused a decrease in serum triglycerides (TG) and non-esterified fatty acid concentrations as well as hepatic TG and total cholesterol (TC) levels. An increase in the fecal excretion of TG and TC along with the decrease in activity of hepatic lipogenesis-related enzymes including fatty acid synthase, glucose-6-phosphate dehydrogenase and malic enzyme in the liver was also detected upon the intake of IGH.[24]

Anti-inflammatory activity

Deshpande et al., carried out a study on the Anti-inflammatory activity of the leaf and stem aqueous extracts of *coccinia grandis*. Sprague Dawley rats (120-150 g) and Swiss albino mice (40-50 g) were used for the study. The effects of extracts and indomethacin on the acute phase of inflammation were investigated. Doses of extracts (50,100 and 200 mg/kg) were administered orally once a day for a period of about 2 days. After one hour the last dose was administered; 0.2 ml of formaldehyde (1%, w/v) injected into the rat hind paw. Before formaldehyde injection, the paw volume for each rat was measured separately by means of Plethysmometer. Edema caused by formaldehyde was measured at 3, 6 and 24 hr of the first day, and also measured once per day on the following days until inflammation disappeared. The anti-inflammatory potency of the extracts was determined by comparing it with a group in which a 10 mg/kg dose of indomethacin has been administered orally. Aqueous extract of the leaves showed a more significant percentage inhibition of paw edema than the aqueous extract of stem and standard, used as indomethacin. So *Coccinia grandis* can be thought to possess antiproliferative and antiarthritic activities similar to indomethacin.[25]

Niranjan Sutar et al., carried out the Evaluation of anti-inflammatory activity of *Coccinia indica* leaves extract. Investigations were performed using different phlogistic agents-induced paw edema such as Carrageenan-induced paw edema and Dextran- induced paw edema in rats. Wistar rats of either sex weighing 160-180 g were used for the study. Various extracts, ethanol and aqueous of *Coccinia indica* leaves at a dose of 250 mg/kg and 500 mg/kg orally were tested. Diclofenac sodium at the dose of 10mg/kg was used as the standard. Both the extracts showed significant activity compared with the control in both the models.[26]

Analgesic and Antipyretic Activity

Aggarwal Ashish S et al., investigated the Analgesic and antipyretic activity of methanolic extract (50, 100 and 200 mg/kg) of *Coccinia grandis* leaves in experimental rats

and mice. Wistar rats (200-250 g) of either sex and Albino mice (Swiss strain) weighing 22-25 g were used for the study. Acetic acid induced writhing, Tail immersion, and Hotplate models were used to evaluate analgesic activity and Yeast induced pyrexia model was used to evaluate antipyretic activity. Findings showed that oral administration of methanol extracts significantly inhibit acetic acid-induced writhing in mice in a dose-dependent manner but failed to show significant inhibition in Tail immersion and Hotplate models. The antipyretic study revealed that methanolic extract exhibits a significant reduction in pyrexia that was comparable to the standard drug.[27]

Anticancer Activity

Bolay Bhattacharya et al., carried out the In vivo and in vitro anticancer activity of *Coccinia grandis* on Swiss albino mice. Anticancer activity of the plant extract against Ehrlich Ascites Carcinoma (EAC) cell on mice was carried out. The mice were divided into four groups each group consisting of 10. Ethanol extracts and vinblastine (reference drug) were injected intraperitoneally. After treatment for nine days, mice were weighed and sacrificed on the 10th day. Viable (live) and nonviable (dead) cell counting, intraperitoneal fluid volume, packed cell volume, hemoglobin concentration, RBC counting, WBC counting and survival time in terms of days were determined. Ethanol extract produced a significant reduction in the viable cell and an increase in the number of nonviable cell count.[28]

Larvicidal Activity

SI Mohammed et al., carried out the Evaluation of Larvicidal Activity of Essential Oil from the leaves of *Coccinia grandis* against three Mosquito Species. The essential oil was extracted by hydro distillation using Clevenger apparatus and was analyzed for chemical constituents by gas chromatography-mass spectrophotometry (GC-MS). Larvicidal activity was recorded after 12th and 24th hr of post-exposure against the three mosquito species, Anopheles stephensi, Aedes aegypti and Culex quinquefasciatus. Dead larvae were identified as they failed to move after probing with a needle in the siphon or cervical region. The LC50 and LC90 values of the three mosquito larvae were calculated by Probit analysis. GC-MS analysis revealed that the essential oil contains 23 different constituents. Out of the 23 constituents, major constituents identified were n-tetracosane (39.18%), n-eicosane (30.04%), tetratriacotane (2.97%), 7-oc-tadecanal (2.81%), and tricosane (2.31%). Essential oil from leaves of *Coccinia grandis* exhibited considerable larvicidal activity against An. stephensi with LC50 and LC90 values 39.41ppm and 123.24ppm. This was followed by Ae.aegypti and Cx. quinquefasciatus with LC50 and LC90 values of 48.20ppm, 131.84ppm and 52.80ppm, 135.48ppm, after 24hrs of exposure.[29]

Mast Cell Stabilizing, Antianaphylactic, and Antihistaminic Activity

Dnyaneshwar J Taur et al., conducted a study on the Mast Cell Stabilizing, Antianaphylactic and Antihistaminic Activity of *Coccinia grandis* Fruits in Asthma. Ethanol extract of *C. grandis* fruit (ECGF) at 100, 125 and 150 mg/kg i.p., was evaluated for mast cell stabilizing, antianaphylactic and antihistaminic activity using egg albumin induced mast cell degranulation in mice; passive cutaneous anaphylaxis in rats and for clonidine-induced catalepsy in mice. ECGF at (100−150 mg·kg−1, i.p.) significantly protected egg albumin induced degranulation of mast cells and caused reduction of blue dye leakage in passive cutaneous anaphylaxis in a dose-dependent manner. The treatment ECGF also inhibited the clonidine-induced catalepsy in a dose-dependent manner. Phytochemical studies observed the presence of saponin, steroids, alkaloids, flavonoids, and glycosides.[30]

Effect of Coccinia grandis in Alzheimers Disease

G.Shalini et al., carried out an in silico evaluation of coccinia grandis fruits against Alzheimer's disease. The aim of the study was to find out the effectiveness of the reported phytocompounds from *coccinia grandis* fruits against Alzheimer's disease. Acetylcholinesterase is an important target in the treatment of Alzheimer's disease and it was taken as the receptor for this study. The reported phytocompounds were taken as ligand molecules and the 3D structure of human acetylcholinesterase was retrieved from the PDB database. The 3D structure of the synthetic drug and reported phytocompounds were obtained from the Pub Chem database. The Docking studies were performed using Glide (a Schrodinger module). From the results obtained, it was observed that the phytocompounds β-sitosterol (-8.70 Kcal/mol), Pectin(-7.82 Kcal/mol), Retinol (-7.24 Kcal/mol) and Taraxerone (-6.40 Kcal/mol) had better glide score than the synthetic drug rivastigmine (-5.6 Kcal/mol). Therefore it can be suggested that intake of coccinia grandis fruits can be used to reduce the severity and progress of Alzheimer's disease.[31]

CONCLUSION

In view of the above discussion, it can be concluded that *coccinia grandis* is a versatile medicinal plant and its multiple benefits is a true miracle of nature. Numerous studies have been conducted on different parts of the plant and thus being proven that every part of this plant is valuable as a medicine. This review gives a new dimension to researchers to find other valuable properties of this wonderful plant. Hence an extensive investigation of the plant and its phytoconstituents on their pharmacodynamics, kinetics and proper standardization and clinical trials is needed to exploit its toxicity profile and therapeutic utility which may bring about the plant as a suitable candidate for further studies towards isolation of efficacious therapeutic agents. This plant has been developed as a drug by pharmaceutical

industries. Developing different type of formulations, based on patient compliance by using these type of plant extracts may produce tremendous changes in pharma Industry and society will be free from many diseases.

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