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A Detailed Pharmacological Approach Coccinia Grandis: A Review

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ABSTRACT: Cocciniagrandis Linn, also known as Cocciniaindica belong to the family Cucurbitaceae. The Cucurbitaceae family is commonly known as gourd, melon and pumpkin family. Cocciniagrandis is mostly used by human as a food crop in several countries such as Australia, Asia, Caribbean, and the southern united states. The fruits, roots, the stem of this plant were used traditionally to treat disease like leprosy, jaundice, asthma, bronchitis, skin eruptions, burns, tongue sores, eye infections, nausea, insect bites, and fever. The leaves of this plant were used to treat diabetes. The leaves of plant possess antioxidant properties, and produce an analgesic, antipyretic and anti-inflammatory effect in rats. The hydroethanolic extract of leaves of Cocciniagrandis indicated the presence of phenols, tannins, saponins, flavonoids, and polyphenols may contribute to the antioxidant and anti-inflammatory activity of the leaves. The plant leaf extract also shows significant activity chemoprotective effect against cyclophosphamide, commonly used in the treatment of cancer and autoimmune diseases.A review of the various studies on the plant is provided significants role of medicinal properties.

Keywords- Cocciniagrandis, Pharmacological Property, Phytochemical, Phytochemistry

I. INTRODUCTION

Cocciniagrandis (Ivy gourd) belonging to Cucurbitaceae family, used as vegetable and grown throughout Indian subcontinent. It is commonly known as kundru in India. Ivy plant has been used in traditional medicine as household remedy for various diseases. Cocciniagrandis (Voigt) plays a major role in the medicinal properties. The plant part of C. grandis such as roots leaves and fruits are used for numerous medicinal purposes like wound healing, ulcers, jaundice, diabetes and antipyretic analgesic, anti-inflammatory, antitussive, antioxidant, anti-mutagenic, antibacterial, anti-protozoal, hepatoprotective, expectorants. [2]

It can be found growing in the wild and on fallow lands throughout Bangladesh. The plant is considered to be a significant medicinal plant by the folk medicinal practitioners of Bangladesh, being used for treatment of diabetes, pain, hypertension, fever, jaundice, and gastrointestinal problems. Locally, the plant is known as telakucha or telakochu.[1]

The Ayurveda is the oldest system of medicine prevalent for about 5000 years in India. The Chinese system of medicine dates back to 200 B.C and is equally practiced today. The Unani system of medicine also called as Greco- Arab medicine is as old as the father of medicine 'Hippocrates' (460- 360 B.C). The World Health Organization (WHO) has listed 21,000 plants as herbs or medicinal plants.[2]

Among these 2500 species are found in India. Around 800 plants have been used in the indigenous system of medicine. Herbal drugs have many advantages over the synthetic formulations in having a longer pharmacological effect and lesser metabolic toxicity. The World Health Organization (WHO) estimated that about 80% of the population living in the developing countries rely almost used traditional medicine for their primary health care need.[2]

Botany of Plant Cucurbitaceae-

The cucurbits are characterized by having 5-angled stem and coiled tendrils. The leaves are alternate and usually palmately 5-lobed or divided without stipules. The flower is actinomorphic and dioecious. The calyx bears 3-6 lobes and a 3-6 lobed sympetalous corolla is found. The androecium is highly variable, consisting of basically 5 distinct to completely connate stamens that are twisted, folded or reduced in number. The gynoecium consists of a single compound pistil of 2-5 carpels. Generaly with one style and many style branches. The ovary is inferior with one locule and

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usually numerous ovules. The fruit is a type of berry called pepo.[2]

Fig. 1 Cocciniagrandis

Kingdom	Plantae
Division	Magnoliopsida
Class	Magnoliophyta
order	Violales
Family	Cucurbitaceae
Genus	Coccinia Wight & Am
Species	Coccinia Grandis L Vight.

II. TAXONOMICAL CLASSIFICATION OF PLANT-

MEDICINAL VALUE OF VARIOUS PARTS OF COCCINIA GRANDIS-

Plant part Medicinal value	**Plant part Medicinal value**
Leaf	Antidiabetic, oxidant, larvicadal, GI disturbances, Cooling effect to the eye, Gonorrhea, hypolipidemic, skin diseases, urinary tract infection.
Fruit	Hypoglycemic, analgesic, antipyretic, Hepatoprotective, tuberculosis, eczema. anti-inflammatory.
Stem	Expectorant, antispasmodic, asthma, bronchitis, GIT disturbances, urinary tract infection, skin diseases.
Root	Hypoglycemic, antidiabetic, skin diseases, removes pain in joint, urinary tract infection.

Vernacular Names of Plant:

Marathi	Tindora, Tondli
Hindi	Parval, Tindora, Tinda, Kundru
Danish	Skariagenagurk
English	Scarlet
Telagu	Dondakaya
Kannada	Tondekayi
Malayalam	Tendli, ghiloda, kundri, kowai.
Chinese	Hong Qua
Japanese	Yasai, karasuuri

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III. PLANT DESCRIPTION-

It can grow up to 3m (i.e., 9ft 10in). The roots are tuberous; stems are green along with simple axillary tendrils. Leaves are glabrous and pentagonal in shape with dentate margins measuring about 6.5 to 8.5 cm long and 7 to 8 cm wide. Flowers are monoecious, white, star-shaped about 4cm in diameter and contain 5 tubular petals, female and male flowers emerge at the axils on the petiole having 3 stamens. The fruit is the edible part of the plant; they are slimy in touch, pulpy and ovoid to an ellipsoid shape. Young fruits are green in colour and turn to scarlet red when ripen which ranges from 2.5 to 5 cm in length and 1.3 to 2.5 cm in diameter. Fruits contain numerous seeds with thickened margins measuring up to 6 to 7 mm in length.[6]

Geographical distribution-

Cocciniagrandis native range extends from Africa to Asia, including India, the Philippines, China, Indonesia, Malaysia, Thailand, Vietnam, Eastern Papua New Guinea, and the Northern Territories, Australia. Its documented introduced range includes the Federated www.wjpr.net Vol 4, Issue 10, 2015. 731 Sujata World Journal of Pharmaceutical Research States of Micronesia, Fiji, Guam, Saipan, Hawaii, the Marshall Islands, Samoa, Tonga, and Vanuatu. Native to tropical Africa and Asia, it was introduced to Hawaii as a backyard food crop. It is sometimes tolerated along garden fences and other outdoor features because of its attractive white flowers. In Hawaii, this plant has spread quickly through Manoa Valley to Punchbowl and into Waimanalo, Oahu, and into the Kona area. In parts of the Caribean it is known as lizard food. [12]

Botany

Cocciniagrandis 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.[12]

Leaves

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, where as the lower is hairy. There are 3–8 glands on the blade near the leaf stalk. Tendrils are simple. Cocciniagrandis is dioecious. [12]

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 Cocciniagrandis flower is inferior. Staminate flowers solitary, rarely in auxiliary 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 stalks10-30 mm long, hypanthium 10-15 mm long.[12]

Fruit

The fruit is red, ovoid to elliptical, 25–60 mm long, 15– 35 mm in diameter, glabrous, hairless on stalks. [12]

Seeds

Seed are 6-7 mm long, tan-colored, margins thickened. [12]

Root

The roots and stems are succulent, tuberous and most likely facilitate the plant to survive prolonged drought. Desperations of Cocciniagrandis 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 gourd. [12]

Phytochemical Analysis:

Phytochemical analysis of hydroethanolic extract of leaves of Cocciniagrandis indicated the presence of phenols, tannins, saponins, terpenoids, and flavonoids. The presence of saponins, flavonoids, and polyphenols may contribute to the antioxidant and anti-inflammatory activity of the leaves. Elemental analysis of the ash of the plant parts revealed the presence of copper (Cu), manganese (Mn) and zinc (Zn) at 0.030 mg/100 mg of ash, 0.213 mg/100 mg of ash and 0.108 mg/100 mg of ash respectively.[4]

IV. CHEMICAL CONSTITUENTS

Aerial part - Heptacosane, Cephalandrol, β -sitosterol, Alkaloids Cephalandrins A and B, Fruits- β- Amyrin Acetate, Lupeol, Cucurbitacin B, Taraxerone, Taraxerol, β-carotene, Lycopene, Cryptoxanthin, Xyloglucan, Carotenoids, β-

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sitosterol, Stigma-7-en-3-one. Root - Resin, Alkaloids, Starch, Fatty Acids, Carbonic acid, Triterpenoid, SaponinCoccinoside, Flavonoid Glycoside, Lupeol, β-amyrin, β-sitosterol, Taraxerol.[3]

Nutritional Value

Cocciniagrandis is a well-known vegetable consumed either cooked or raw. In most parts of the world, unripe fruits were consumed cooked whereas ripe fruits are sweet in taste and are bright red in color. The fruits of the plant are rich in Iron, Vitamin B, Beta carotene and Vitamin A. In certain parts of the world like the Mursi tribe in Ethiopia consumes leaves as a vegetable. The nutritional content of Cocciniagrandis leaves and shoots were found to be comparably richer than many of the common vegetables such as celery, lettuce and asparagus in terms of mineral elements, protein, amino acids and vitamins. The nutritional content of 100 g of leaves of C. grandis is given in Table 4.[6]

Nutritional Value Chart:

Content	Fruits (100g or 1 cup)	Leaves (100g or 1 cup)
Energy	18 Kcal/ 75 kJ	32 Kcal
Protein	1.2g	3.6g
Carbohydrates	3.1g	3.9g
Lipid or total fat	0.1g	0.2g
Total dietary fiber	1.6g	2.7g
Iron (Fe)	1.4g	1.4mg
Calcium	40mg	57mg
Potassium	30mg	--
Riboflavin (Vit B2)	0.08mg	--
Thiamin (Vit B1)	0.07mg	--
Ascorbic acid (Vit C)	1.4mg	13mg
Niacin (Vit B3)	0.007mg	--
Beta- carotenoids	4.036µg	4.036µg
Zinc	--	0.5mg
Vit A (retinol equivalent)	--	673µg

Traditional uses

C. grandis has diverse traditional uses in different countries, especially in Asia and Africa. In some countries of Asia, such as Thailand, C. grandis leaves are used to make tonic-like drinks for medicinal purposes. Shoots, flowers, and fruits of this plant are used as medicine for various ailments and fodder in Northeast Thailand. Folk healers of Thailand suggest drinking fresh boiled leaves of C. grandis in case of hypertension caused by high body temperature or fever. In Nepal, the root juice of this plant is used for uterine discharge and fruits are taken as jaundice medicine. C. grandis is also mixed with another plant leaf named Hydrocotylenepalensis for piles treatment. In Pakistan, the juice of the leaf and root of this plant is taken in the morning for the treatment of. In Africa, the roots of C. grandis are used to treat intestinal troubles and diabetes. The fruits and leaves are used to reduce high blood pressure and a mix of pounded leaves and fat is applied externally for spleen problems and abdominal pain, and to lighten the skin mix of pounded leaves and fat is applied externally.

In Noakhali, Bangladesh, C. grandis is locally known as kolakochu, and a paste of crushed leaves is used for diabetes and cancer treatment. In Pabna, Bangladesh, C. grandis is locally known as Telakucha, and people in this region utilize this plant as both a vegetable and herbal medicine. The residents of this area employ the juice extracted from crushed leaves and stems to treat diabetes and jaundice. In the Comilla district, Bangladesh, a mixture of C. grandis root juice and coconut oil is applied externally to the head as a remedy for mental disease. Additionally, the boiled plant is used for the treatment of diabetes. Leaves are chewed every morning to control blood sugar levels and leaf juice is taken for hypertension. The Chakma Tribe of Bandarban District, Bangladesh, consumes raw leaf juice to control diabetes. The urban people of Khurda, Odisha, India, consume Ivy gourd fruit juice with dried seed powder of Piper nigrum on an empty stomach once a day to reduce blood sugar. Local traditional healers of karela, India, frequently use the leaves and fruits of this plant to treat different ailments such as skin disease, body strength, sperm production, and

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diabetes. Local people take C. grandis leaves and fruit paste with milk for diabetes and with sugar for jaundice.[11]

V. PHARMACOLOGICAL ACTIVITY

Antimalarial

Extract of Cocciniagrandis shows excellent antiplasmodial activity against the Plasmodium falciparum (Sundaram et al., 2012). Aqueous leaf extract of Cocciniagrandis decreases the SGPT, SGOT, ALP, total protein, blood urea nitrogen concentration. Hydrophilic moiety of Cocciniagrandis extract is responsible for antimalarial activity. The extract reduces the significantly the Plasmodium berghei parasite count in mice. The Larvicidal activity of Cocciniagrandis in which methanolic extract of Cocciniagrandis is used.[3]

Anti-inflammatory

Cocciniagrandis 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, prostagrandis, 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 Cocciniagrandis extract.[3]

Antiulcer Activity

The anti-ulcer activity of aqueous extract of leaves of Cocciniagrandis was investigated in pylorus ligation and ethanol induced ulcer models in experimental rats. Ulcer index was determined in both models. Aqueous extract of Cocciniagrandis 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 evaluated the Ethanol, aqueous and total aqueous extract for antiulcer activity in pylorus ligation induced gastric ulcer. Ethanolic extract showed the antisecretory mechanism for their antiulcerogenic activity. Ethanolic extract of plant extract at 400 mg/kg exhibited antiulcerogenic activity as that of Omeprazole.

Antipyretic Activity

Evaluated methanolic extract of Cocciniagrandis 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. Cocciniagrandis extract contains glycosides, alkaloids, flavonoid, terpenoids, phenols and tannins. Analgesic Activity 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 Cocciniagrandis. A Methanolic extract of the leaves of Cocciniagrandis revealed the presence of glycosides, alkaloids, flavonoid, terpenoids, phenols and tannins. Analgesic action of the active compound(s) in the methanol extract of Cocciniagrandis may be mediated through peripheral but not central mechanism. Cocciniagrandis reduce the complications produced by acetic acid.

Hypoglycemic Activity

Evaluated Combined extracts of Musa paradisiaca and Cocciniaindica 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 diabetic rat.

Antifungal Activity

Antifungal activity of the Cocciniagrandis leaves extract against the Candida albicans-II, Candida tropicalis, Aspergillus Niger, Saccharomyces cerevisiae, Candida tropicalis II, Cryptococcus neoformans and Candida www.wjpr.net Vol 4, Issue 10, 2015. 736 Sujata World Journal of Pharmaceutical Research 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 extraction more sensitive for Aspergillus Niger and both strains of Candida albicans.

Mutagenic effect

Aqueous extract of leaves of Cocciniagrandis showed inhibition of growth and mutagenesis on Neurosporacrassa by a gradual decrease of growth of mycelia. This result indicates

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that Cocciniagrandis plant shows mutagenic effect on Neurosporacrassa.

Alpha-amylase inhibition

The methanolic extract of Cocciniagrandis for alpha amylase inhibitory activity. The dried plant material extracted with 50% aqueous methanol (10 ml/g dry Journal of Applied Pharmaceutical Science 3 (05); 2013: 114-119 wt.) and redissolved in 50% aqueous DMSO (10 ml/g dry wt.) and subjected to alpha-amylase inhibitory activity. The Cocciniagrandis showed the 81.13% of alpha amylase inhibitory activity

CONCLUSION-

The literature survey revealed that Cocciniagrandis has been widely studied for its pharmacological activities. It can be concluded that Cocciniagrandis is an important source of many pharmacological and medicinally important chemicals. Plant extracts have significant antimalarial, anti-inflammatory, Antiulcer, antipyretic, hypoglycemic, Antifungal, mutagenic effect, Alpha-Amylase inhibition, antioxidant, hepatoprotective, antidyslipidemic, anticancer, antitussive, mutagenic activity in different animal models.

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