

Review Article

A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL SIGNIFICANCE OF *CANTHIUM PARVIFLORUM* LAM

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ABSTRACT

A large number of medicinal plants are explored from the natural flora for production of commercial drugs. Approximately 20% of the plants found in the world have been submitted to pharmacological or biological tests. *Canthium parviflorum* is an important medicinal plant used in indigenous system of medicine in India and abroad. To isolate and characterize biologically active molecules, many medicinal plants were screened. Though the medicinal importance of this plant is known, but the potential source of this plant for biologically active molecules is not known. So, the present review on *Canthium parviflorum* is opens a gateway to find out useful and novel drugs.

Keywords: *Canthium parviflorum*, Rubiaceae, Medicinal importance, Phytochemicals, Pharmacological.

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INTRODUCTION

Many drugs commonly used today are of herbal origin. Indeed, about 25% of the long prescriptions dispensed in the United States contain at least one active ingredient derived from plant material. Some are made from plant extracts others are synthesized to mimic a natural plant compound [1]. All through the human history, there has been a noticeable concern for health care and the cure of disease, though the concepts themselves took a very long time to develop into a body of knowledge. A logical approach to the study of drugs and their activities is the recognition of the basic principles behind the biochemical events leading to drug actions [2]. Nowadays, an increasing amount of insight into the behavior of drugs at the macromolecular level has been developed, and there is a lot of direct and indirect evidence supporting these biochemical postulations of drug action [3].

Plant description

Kingdom: Plantae

Divison: Magnoliophyta

Class: Magnoliopsida

Clade: Angiosperms

Order: Gentianales

Family: Rubiaceae

Subfamily: Ixoroideae

Genus: *Canthium*

Species: *parviflorum*

Canthium parviflorum Lam. (syn: *Plectoria parviflora*) of Rubiaceae is commonly called as Balusu in Telugu, Carray cheddie in English, Kirma in Hindi and Mullukaarai in Tamil. *Canthium parviflorum* is a thorny sub scandent shrub grows up to 3meters height with spreading branches distributed throughout India in shrub forests and dry plains. Its leaves and roots are medicinally important and belong to the family Rubiaceae. Leaves are simple, opposite, small, and acute with axillary spines. Flowers are white, small in axillary cymes. Fruits oblong two-chambered drupe, become yellow when ripe. All the plant parts such as roots, leaves, fruits and stems are pharmacologically useful.

Medicinal importance

Rubiaceae species were a valuable source of new secondary metabolites for medical purposes. In Ayurvedic system of medicine, *Canthium parviflorum* used as laxative and also to cure gout. *Canthium parviflorum* plant is having germination problems and is frequently attacked by *Meliola* fungi [4]. Based on the previous reports this plant material is used for its pharmacological importance as an anthelmintic, antidiarrhetic, antispasmodic and as a diuretic [5]. Traditionally the roots and leaves are used to cure vitiated conditions of kapha in fever and constipation [6].

Leaf

Since *Canthium parviflorum* leaf is used as an astringent, it was presumed that the leaf showed wound healing property [7]. Leaf paste is externally applied twice a day to treat scabies and the ringworm infection [8]. The *Canthium parviflorum* as herbal medicine is used for the treatment of diabetes among major tribal groups in South Tamilnadu [9]. Decoctions of leaves are used for wound healing in animals.

Root

The roots of this plant are traditionally used by the tribes of Orissa in the treatment of swelling of neck. The roots are astringent, sweet, thermogenic, diuretic, febrifuge, constipating, anthelmintic, and tonic. They are used in vitiated conditions of kapha, diarrhoea, strangury, fever, leucorrhoea, intestinal worms, and general debility [10, 11].

Fruit

Tribes of Orissa state in India use fruits of this plant to treat a headache. It is traditionally used for snake bites [12]. Krishna *et al.* (2014) [13] reported that the root material with methanol extract of



Canthium parviflorum Lam.

Canthium parviflorum showed anthelmintic activity. The root and leaf paste of *Canthium parviflorum* are very useful for diuretic [14]. This plant contains high quantities of total carotenoids and beta carotenoids which are very essential for vitamin A activity. The leaves and fruits are edible. The *Canthium parviflorum* is the richest source of β -carotene and 100 g of edible fruit position contains 9.51 mg carotenoids and 6.10 mg of β -carotene [15].

Phytochemicals

Plant drugs, therefore, continue to constitute an important part of the medicines used even today especially in the areas of modern medicine and also in traditional medical systems like in our traditional Ayurveda, Siddha and Unani as an immunomodulator. However, the potential use of higher plants as a source of new drugs is still poorly explored. Of the estimated 250,000-500,000 plant species, only a small percentage has been investigated phytochemically, and even a smaller percentage has not been properly studied in terms of their pharmacological properties. In most cases, only pharmacological screening or preliminary studies have been carried out and it is also estimated that only 8000 species have been studied for medicinal use [16].

Phytochemical analysis revealed the presence of secondary metabolites like alkaloids, flavonoids, tannins, steroids, saponins, terpenoids, sanranetin-4-O-glycoside long chain acids and cardiac glycosides in *Canthium parviflorum* leaf extracts [17]. Pasumarthi *et al.* (2011) [18] reported that the *Canthium parviflorum* leaves with aqueous and methanol extracts revealed the presence of tannins, alkaloids, flavonoids, saponins, steroids, anthraquinones and reducing sugars. *Canthium parviflorum* leaves with hexane and ethanolic extracts revealed the presence of various biochemical compounds such as flavonoids, glycosides, alkaloids, saponins, tanins, phlobatanins, reducing sugars and terpenoids [19]. The phytochemical screening revealed the presence of terpenoids, saponins, steroids, tannins, quinones and gums in *Canthium parviflorum* leaves [20].

Ethanolic extracts of *Canthium parviflorum* reported that the 22 active constituents present in the leaf which are later confirmed by GC-MS analysis Biphenyl, 2-Methyl-4-heptanone, Di-Isodecyl Phthalate, 1,2,4,5-Tetroxane, 3,3,6,6-Tetrapheny,-3-Oxo-Alpha-, Ionol, Methyl 7-hydroxy-2-methyl-3,5-octadienoate, 4-(2-Hydroxy-2,6,6-Methyl cis-11,14,17-Icosatrienoate, Trimethyl cyclohexyl)-3-buten-2-one, n-Hexadecanoic acid, E-11-Hexadecanoic acid, Ethyl ester, Ethyl Hexadecanoate, Phytol, Ethyl (9Z,12Z)-9,12-Octadecanoate, Ethyl Linolenate, 1-Hexadecanol, 2-Phenoxy-2-phenylpropanoic acid, All-trans-squalene, Methyl Linolenate, Gamma-Tocopherol, DEPH; 1,2-Benzenedicarboxylic acid, bis (2-hylhexyl) ester, Stigmasterol and Gamma-stigmasterol [21]. Based on the phytochemical results, it is concluded that *Canthium parviflorum* is most economically valuable plant.

Thorns and leaves of *Canthium Parviflorum* has Taraxerrol, D-mannitol, petunidin and B-sitosterol, sakuranetin-4'-O-glycoside valuable phytochemicals [22]. Thorns of this plant have been found to contain tara xeroll, d-mannitol, petunidin and long chain esters. The wild plant extracts of *Canthium parviflorum* contains phytochemicals such as alkaloids, oils, flavonoids, gums, phenols, saponins, steroids, tannins and terpenoids [23].

Krishna *et al.* (2014) [13] reported the roots with ethyl acetate and crude methanol extracts of *Canthium parviflorum* showed glycosides, alkaloids, flavonoids, tannins and carbohydrates. Based on the qualitative phytochemical analysis it is concluded that the root material of *Canthium parviflorum* extracted with methanol, ethyl acetate, water, hexane and acetone contains betacyanin, acids, quinones, alkaloids, carbohydrates, terpenoids, fixed oils and fats, flavanoids, gums and mucilages tanins, reducing sugars and volatile oils [24]. Various phytochemicals like terpenoids, phenols, saponins, gums, oils and quinones are present in the seed extracts of *Canthium parviflorum*.

Antioxidant activity

The major goals of antioxidant treatments are to reduce oxidative stress by preventing or delaying the progression or reversing the complications of the disease. Medicinal plants often contain substantial amounts of antioxidants such as polyphenols, flavonoids, anthocyanins, and tannins.

Antioxidant and diuretic activity were exhibited by extracts of *Canthium parviflorum* leaves [25]. More antioxidant activity exhibited by the leaf extract of *Canthium parviflorum* [26, 14, 27]. This anti-oxidant activity might be attributed due to the presence of phytochemicals such as flavonoids and bioflavonoids [28]. Palvai *et al.* (2014) [29] reported that the methanolic leaf extract of *Canthium parviflorum* exhibited good antioxidant activity. Prabhu *et al.*, (2014) [30]. Reported that the *Canthium parviflorum* leaf extracts showed Potent of antioxidant and anti-arthritis activity

Previously reports on methanolic fruits extract of *Canthium parviflorum* showed more antioxidant properties [31]. Ravichandra *et al.* (2014) [32] reported that the bark extract of *Canthium parviflorum* exhibits free radical scavenging activity.

Anticancer

Natural products have afforded a rich repository of remedies with diverse chemical structures and bioactivities against several health disorders including cancer. The cell line studies reported the *In vitro* anticancer activity of methanolic extract of *Canthium parviflorum* on DLA and Hela cell lines [33]. Pasumarthi *et al.* (2011) [18] reported that the methanolic leaf extract of *Canthium parviflorum* showed a potent cytotoxic activity. John *et al.*, (2014) [34] reported that the acetone root extract of *Canthium parviflorum* showed maximum anticancer activity both *in vitro* and *In vivo* studies carried out in male Swiss albino mice.

Antimicrobial activity

The antimicrobial nature of the plants has been attributed to the wide variety of compounds they synthesized. The screening of bioactive compounds has always been great interest to a scientist for new source of drugs useful in the treatment of infectious diseases. Many reports showed the effectiveness of traditional herbs against microorganisms. As a result plants are one of the bedrocks for modern medicine to attain new principles.

Previous reports on wild plant leaf extracts of *Canthium parviflorum* contain very low antimicrobial activity against *E. coli* and various selected bacteria and ineffective against *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Klebsiella oxtoca*, *Proteus mirabilis*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* [35]. Another report on wild plant material of *Canthium parviflorum* exhibits high antimicrobial activity against the Gram-positive (*Bacillus subtilis* and *Staphylococcus aureus*), Gram negative strains (*E. coli* and *Klebsiella pneumoniae*) and antifungal activity against *Aspergillus niger*, *A. fumigatus* and *Candida albicans* [23]. Ramanathan *et al.* (2013) [20] reported the leaf extract of *Canthium parviflorum* showed potent antimicrobial activity with aqueous, methanol and chloroform extracts against *Escherchia coli*, *Klebsiella pneumonia*, *Staphylococcus aureus*, *Aspergillus niger* and *Penicillium sp.*

Antidiabetic activity

The World Health Organization (WHO) estimates that currently more than 180 million people worldwide have diabetes, and it is likely to double by 2030, with India, China, and United States predicted to have the largest number of affected individuals [36]. Plants have provided a source of inspiration for novel drug compounds as plants derived medicines have made a significant contribution towards human health [3]. *Canthium parviflorum* is an herbal medicine used for the treatment of diabetes among major tribal groups in South Tamilnadu [9].

Anti-inflammatory activity

Due to the fast growing interest in the anti-inflammatory activity of medicinal plants by pharmaceutical companies and scientific research on the discovery of novel anti-inflammatory compounds, medicinal plants could potentially serve as leads in the production of new drugs for treating pain-related ailments with reduced or no side-effects.

Canthium parviflorum leaves showed significant anti-inflammatory activity in *in vitro* methods tested by protein denaturation method. Denaturation of proteins is a well-documented cause of inflammation and rheumatoid arthritis and the terpenoids and flavonoids showed remarkable anti-inflammatory activity [19].

Hypocholesteromic activity

Canthium parviflorum leaves with ethanol extract produced a significant hypoglycaemic effect in alloxan and STZ-induced diabetic rats. The concurrent effect of *Canthium parviflorum* on lipid metabolism was significant in diabetic rats; this was evidenced by the reductions in serum cholesterol, triglycerides and lipid peroxides [37].

CONCLUSION

Vast wealth of medicinal sources still has to use for curing a number of diseases. In order to find new sources of plant drugs, numbers of plants have been screened for various biological activities in various search institutions. *Canthium parviflorum* is an important medicinal plant used in indigenous system of medicine in India and abroad. So, based on these medicinal attributes concluded that *Canthium parviflorum* is most economically and pharmacologically valuable plant.

CONFLICT OF INTERESTS

Declared none

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