



Crossandra Infundibuliformis: A Review Study On Ethnobotany, Phytochemical Investigation And Pharmacology.

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Abstract

Crossandra infundibuliformis is a well-known plant in India for its therapeutics Profits even in fields of medicine inclusive of Ayurveda and siddha yoga of traditional Medicine in the whole world for the treatment of several ailments.it has been looked upon as the conventional utilities of Crossandra infundibuliformis got their identification when tested using distinguished disease-based pharmacological models taking diverse extracts of roots, leaves and steam as test subjects. every single part of this plant is used to remove the active phytochemistry.in this study the main exploration revealed the existence of so many phytochemicals that are domestic to this plant leaves.it revealed the existence of secondary metabolites as well as other compounds like tannins, saponins, alkaloids, flavonoids, steroids, glycosides, terpenoids, and carbohydrates. In this Review, we choose only those compounds whose pharmacology has been reported. We also concisely discuss the ethnobotany of the plant. Further to a greater extent study jurisdiction on pharmacology are also proposed where needed.

Keywords: *Crossandra infundibuliformis* plant.

Introduction

Crossandra infundibuliformis belongs to the Acanthaceae family. This plant has been proved to have various medicinal properties. *Crossandra infundibuliformis* is a popular tropical flower known as “Firecracker” because the seed pods that are usually formed after flowering tend to explode under high humid conditions ^[1]. It is a plant which is important in South Indian horticulture industry. This plant is found abundantly in tropical areas such as Southern India, Malaysia, and Srilanka ^[2]

It grows 2m in height and can withstand high temperature which makes it to survive in very high humidity. Due to its medicinal value, various parts of this plant are used to treat many diseases. *Crossandra* plants are generally hardy in nature and can be cultivated as loose flowers or potted plants. It is having commercial importance as potted plants in Denmark, Sweden and Hungary^[3]. It has got considerable importance in comparison to other flower crops due to perennial nature, flowering throughout the year, consumption of minimum amount of fertilizers and higher profitability. Medicinal plants are the potential source of active compounds to cure many diseases associated with human beings. The present study reports that phytochemicals are beneficial to drug molecule formulation and drug discovery. The phytochemicals like terpenoids, flavonoids, carbohydrates have therapeutic values ^[4].

Antimicrobial compounds found in various parts of plant have enormous therapeutic potential. They effectively treat infectious diseases while simultaneously mitigating many of the side effects that are often associated with synthetic antimicrobials ^[1, 2]. The leaf extract of *C. infundibuliformis* shows aphrodisiac activity on ethanol induced testicular toxicity in male rats ^[5]. The aqueous and methanol extracts of *C. infundibuliformis* leaves possess antimicrobial activity tested against some common bacterial and fungal pathogens ^[6] Due to its medicinal value, various parts of this plant are used for many types of treatment. The leaf extract shows significant hepatoprotective effects. The evidence suggests that the leaf extracts of *C. infundibuliformis* possesses hepatoprotective effects, antibacterial, antifungal & anticandidal activities ^[7]. It is also found that the *C. infundibuliformis* shows very good anti-corrosive properties. It is an erect, evergreen sub-shrub growing to 1 m with glossy, wavy-margined leaves and fan-shaped flowers, which may appear at any time throughout the lifetime.^[6] flowers are irregularly shaped with 3 to 5 asymmetrical petals. They grow from foursided stalked spikes, and have a tube-like 2 cm stalk. Flower colors range from the common orange to salmon-orange or apricot, coral to red, yellow and even turquoise ^[6]. This plant requires a minimum temperature of 10°C and in temperate regions it is cultivated as a houseplant. It is usually grown in containers but could be attractive if grown in beds.

Plant profile

Biological source: it is obtained by fresh and dried whole plants namely as *Crossandra infundibuliformis* belongs to family Acanthaceae



Figure: Photocopy of *Crossandra infundibuliformis*.

2.1. Species description *Crossandra infundibuliformis*:

The leaves are glossy and most striking, Flowers throughout the year. The deheaded and pinching back maintain a bushy shape and keep blooming with each new flush of growth.

Crossandra greenstock ii

The bushy *Crossandra* is a dwarf herb, sometimes regarded as a shrub. It has widely opening orange petals around a yellow Centre. The flower stalks emerge erectly from basal rosettes of broad green, unevenly lobed leaves.

Crossandra pungens

It is a dense subshrub up to 60 cm tall. Leaves are oblong, dullgreen, traced with pearly veins. Spikes are congested, bracts broadly ovate margins bristly to spiny and colour of flowers is orange.

Crossandra flava

It is an unbranched shrub about 15-20 cm tall with erect and green stem. Leaves are glabrous, opposite, obovate to lanceolate in shape and dark green in colour. Lower leaves are stalked, while upper ones are sessile. Spike is 4 sided with spiny yellow green bracts. Flowers are bright yellow and the corolla tube is much exerted and jointed.

Crossandra guineensis

It is free flowering and about 30-60 cm in height. The bracts do not bear spines and are pale lilac in colour. It can be grown. both in sunny situation as well as in partial shade

Crossandra nilotica

The plants are about 60 cm in height. Stem is semi woody. Leaves are elliptic, dark green and glossy. Brick red flowers are borne in dense spikes. Lower 3 petals form a lip.

crossandra undulaefolia

It is a short branching perennial shrub about 30-90 cm in height. Leaves are about 5-12 cm, long dark green, lustrous and pointed. Spikes are 7.5 to 12.5 cm long and 4 sided. Flowers have prominent spiny bract. It is also known as Fire cracker plant due to the cracking sound of the splitting of the seed pod.

2.2. Origin and Distribution:

This plant is native from Southern India, Malaysia, and Srilanka ^[2]. It is most often found in south india region malenadu and kerala. The estimated area under the cultivation of crossandra in Tamilnadu is around 1317 hectares with the production of 2634 tonnes per annum and the productivity is 2.00 tonnes/ha. The crop is cultivated mostly in South India in the districts of Coimbatore, Madurai, Villupuram, Cuddalore, Pondicherry, Trichy and Thiruvannamalai

Table 1: The morphological Characteristics of *Crossandra infundibuliformis*,

Properties	
Common Name	Crossandra, firecracker flower
Plant Type	Evergreen perennial flower
Mature Size	1 to 3 feet tall and 1 to 2 feet tall
Soil Type	Rich, loamy, well-draining
Sun Expose	Part shade
Soil pH	5.8 to 6.8
Bloom Time	April to October
Flower Color	Orange, apricot, salmon pink, red
Hardiness Zones	10 to 11
Native	Southern
Area	India, Sri Lanka

2.3. Taxonomic Hierarchy.

Taxonomical Classification

Kingdom: plantae

Division: Tracheophyta

Order: Lamiales

Family: Acanthaceae

Genus: Crossandra

Species: *infundibuliformis*

2.4. Vernacular Names

Crossandra infundibuliformis(L.) Nees. (Family –Acanthaceae)

Vernacular Name

Hindi: Krosendra

Tamil: Kanakamparam

Telugu: Krassandra

Marathi: aboli

Gujarati: Krossandra

Bengali: Krasandra

2.5. Plant Description.

Crossandra is a flowering plant in family Acanthaceae, chromosome number of triploid ($2n = 30$) and tetraploid ($2n = 40$). It is a small, evergreen ornamental shrub growing 1 m (3 ft) producing beautiful flowers almost round the year. It has a remarkable range of colours varying from orange, pink, red, yellow and double-coloured blue types with a white throat. The leaves are glossy, oval in shape, upright and deep-green in colour. The flowers are unusually shaped with 3 to 5 asymmetrical petals. Inflorescence is hairy and the florets grow from foursided stalked spikes with prominent bracts. The corolla is cylindrical, more-or-less curved; the stamens are fringed, four in pairs.

2.6. Agriculture Techniques

Crossandra infundibuliformis historically known as “hempedu bumi” (bile of the earth).

This plant has various names in various languages. Regional people easily recognize plant species with vernacular names alternatively of Taxonomical names.

Cultivation and collection

Crossandra is an chief merchant flower, mainly grown up in India, tropical Africa and Madagascar. The flowers are commonly used for hair ornament. Though not fragrant, flowers are very well liked because of its charming bright colour, lighter and good keeping quality. These are used for fabricating garland, either alone or in combination with jasmine flowers. Using crossandra flowers in merged with jasmine is becoming more and more popular in India, especially in southern parts, because the jasmine flowers provide colour distinction and the want fragrance.

Hybrids

TNAU has developed a resistant hybrid by crossing two local types from Palani and Marudhamalai hills. This hybrid is characterized by large attractive yellowish orange flowers showing higher degree of tolerance to nematode-fungal complex. Another hybrid evolved by crossing between the orange flowered cultivar and Sebacaulis Red which produces very attractive dark pink flowers.

Cultural Practices

Soil type: Crossandra is highly susceptible to nematodes. Hence, a field selected for 47 crossandra cultivation should be analyzed for nematode population and correct Crossandra remedial measures should be taken before transplanting. Crossandra can be cultivated in a wide range of soils. Fertile, red loamy soils with pH range of 6 to 7.5 and rich in organic matter are most ideal for successful production of crossandra. Alkaline or saline soils are not suitable because plants develop chlorosis.

Climate Requirement: Crossandra is a tropical plant and cannot tolerate low temperature and frost and mild climate is ideal. It performs well in places where the day temperature is around 30-35°C. Night temperature below 6°C causes frost injury.

Season: The ideal time for planting crossandra is June – July and it may be extended up to September-October.

Pharmacological action:

Antimicrobial activity, wound healing activity, hepatoprotective activity, aphrodisiac activity, antibacterial activity, tuberculosis activity, antisolator activity, antioxidant activity.

Antimicrobial activity

Elamadhi describe about the medicinally active substances were isolated from leaves of Crossandra infundibuliformis by Soxhlet extractor and identified by phytochemical tests. The C. infundibuliformis showed potential antimicrobialactivities against some selected strains .^[19]

Wound healing activity

Rohit gundamaraja clarified that the Flower extract of *Crossandra infundibuliformis* used in various conditions like fever, headache, aperitif, pain etc. the review is concern mainly with evaluation of wound healing activity of flower ethanolic extract. ^[8]

Hepatoprotective Activity

Madhumitha explained about the hepatoprotective effect of the *Crossandra infundibuliformis*. Hepatotoxicity was produced by Petroleum ether extract of dried leaves. ^[9]

Aphrodisiac Activity

Kumar explained that were *Crossandra infundibuliformis* used for treating male sexual disorders since ancient times. Ambition of this study was to test the phytochemical constituents and the aphrodisiac potential of the petroleum ether extract of leaves of *Crossandra infundibuliformis* ^[10].

Antibacterial activity

Sowjanya pulipati..*et.,al* describe about the recent study is designed to evaluate the tannin content and evaluation of antibacterial activity of *Crossandra infundibuliformis* (Acanthaceae) flower extracts against pathogens attached with urinary tract infections. ^[11].

Tuberculosis Activity

Satheesh Kumar describe abot the present work was to extract and screen the leaves and flowers of *Crossandra infundibuliformis* against *Mycobacterium tuberculosis*. This study reveals the first report of the anti-mycobacterial perspectives of leaf extracts of *Crossandra infundibuliformis* ^[12].

Antisolar Activity

Swapna Kandagalttla describe about The present study was aimed to evaluate the UV absorption ability of aqueous extracts of fresh and dry leaves of *crossandra infundibuliformis* as an Anti-solar agent ^[13].

Antioxidant Activity

Kumar G patil describe about the present study was aimed to investigate the phenolic content and antioxidant property of *Crossandra infundibuliformis* leaves. However, results suggests that *Crossandra infundibuliformis* leaves possess antioxidant activity ^[14].

Antiarthritic Activity

Sanakattula Sreevani describe about the present study have been designed to evaluate the In-vitro Anti-Arthritic activity of herbal plant *Crossandra infundibuliformis*. The leaves were collected, dried and extracted by soxhlet with solvents like Methanol, Petroleum Ether ^[15].

Antidiabetic Activity

Galanki Vasantha describe about the present research is to investigate the antidiabetic activity and antioxidant effect of ethanolic extract of *Crossandra infundibuliformis* leaves and stems ^[16].

Antifungal and Anticandidal Activity

Madhumitha describe about the investigate the phytochemical, antibacterial, antifungal and anticandidal activity of successive extracts of *Crossandra infundibuliformis* leaves. ^[17].

Antihyperlipidemic Activity

Vasantha describe about the present study was designed to investigate the hypolipidemic effect of ethanolic extract of *Crossandra infundibuliformis* leaves and stem ^[14].

Anticancer and Insecticidal

Vadivel describe about the ethanolic extract of the leaves of *Crossandra infundibuliformis* were investigated. Anticancer activity evaluated against human breast cancer cell line. ^[15]

Anthelmintic Activity

Panduraju describe about the methanol leaf extract of *Crossandra infundibuliformis* was prepared with distilled water by soxhlation method. The methanol leaf extract is used to evaluate the presence of phytoconstituents and anthelmintic activity. ^[16]

Antiulcer Activity

Narasimha Rao describe about the present study is aimed at investigating the antiulcer effects of flowers methanol extract against aspirin induced ulcer. ^[17]

Ethnobotanical Uses

The extract from the Firecracker plant is also used to **treat minor headaches, aperitif, fever, pain, and also wound healing**. Flower extract used in various conditions like fever, headache, aperitif, pain etc. It is traditionally used for the treatment against various ailments in tropical and subtropical parts of India without any scientific knowledge.

Table 2: Shows the Phytochemical analysis of *Crossandra infundibuliformis*

S.No	Phytochemical Constituents	Aqueous	Ethyl acetate	Acetone	Chloroform	Propane
01	Flavinoids	+	-	+	-	+
02	Alkaloids	-	+	+	+	-
03	Triterpenoids	-	-	+	-	+
04	Saponins	+	+	+	-	-
05	Tannins	+	-	-	-	+
06	Triple Sugar	-	-	-	-	-
07	Amino Acid	-	-	-	-	-
08	Anthroquinones	+	-	-	-	-
09	Steroids	+	+	+	+	+
10	Proteins	-	-	-	-	-
11	Cardiac Glycosides	-	-	+	+	+

“+” = *Present*, “-” = *Absent*.

Conclusion

Available data on *crossandra infundibuliformis* also clearly expresses it have many pharmacological properties of this plant. Due to possessing extensive pharmacological activities, the *Crossandra infundibuliformis* can be safely regarded as one of the modern catholicons. However, the investigated pharmacological activities of *Crossandra infundibuliformis* need validation through the clinical study. This review paper shows the Pharamacognostical studies and the pharmacological activities like Antimicrobial activity, wound healing activity, hepatoprotective activity, aphrodisiac activity, antibacterial activity, tuberculosis activity, antisolar activity, antioxidant activity etc. Extract of *Crossandra infundibuliformis* plant contains more bioactive principles, which act against the representative human pathogens. Moreover, this reviewed article showed more pharmacological applications and Pharmacological studies helps to developing the allopathy and traditional formulations

We assume that the *Crossandra infundibuliformis* could be useful as highly applied therapeutic agents for a variety of disorders in the near future to cure human diseases as well as some animal diseases. To fulfill this dream, the researchers might focus on multiplication of this plant to meet commercial demand besides the pharmacology study, pharmacological study and phytochemical study to find new bioactive compounds as well as conservation of this plant.

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