Research & Reviews: Journal of Agriculture and Allied Sciences ISSN: 2347-226X

Detailed Examination of *Calotropis gigantea*'s Phytochemical and Pharmacological Screening Results for Medicinal Uses

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Research Article

Received: 07-Dec-2023, Manuscript No. JAAS-23-123240; **Editor assigned:** 09-Dec-2023, Pre QC No. JAAS-23-123240 (PQ); **Reviewed:** 23-Dec-2024, QC No. JAAS-23-123240; **Revised:** 22-Jan-2025, Manuscript No. JAAS-23-123240 (R); **Published:** 29-Jan-2025, DOI: 10.4172/2347-226X.14.1.002

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Citation: Suchithra MS. Detailed Examination of *Calotropis Gigantea*'s Phytochemical and Pharmacological Screening Results for Medicinal Uses. RR J Agri Allied Sci. 2025;14:001.

ABSTRACT

In our daily lives and for our health, herbal plants are essential. From ancient times to the present, they have been in use. *Calotropis gigantea* is another significant plant in herbal medicine. *Calotropis gigantea* is well-known for being used in traditional medicine because of its many healing qualities that can treat a wide range of illnesses. Herbal medications are widely accessible in nature and have fewer negative effects. Antioxidants are chemical substances that halt the flow of electrons or hydrogen, preventing other molecules from oxidizing. Reactive oxygen species and free radicals are two threats that antioxidants can fend against in the human body. Antioxidants found in medicinal plants include vitamins, minerals, enzymes, carotenoids, flavonoids, polyphenols, saponins, and polyphenols. The most prevalent polyphenolic components in plant extracts include tannins, alkaloids, phenols, and flavonoids. Numerous phytochemicals have been identified in various portions of *C. gigantea*, particularly the leaves, including flavonoids, terpenoids, alkaloids, steroids, saponins, and terpenes. It offers a variety of therapeutic benefits. Different parts of this plant have been shown in various polyherbal preparations to exhibit anti-inflammatory, anthelmintic, anticancer, and antitumor properties, and to be able to cure a variety of diseases and disorders, including asthma, colds, epilepsy, fever, indigestion, leprosy, piles, and skin diseases. Comprehending diverse pharmacological effects and medical uses is vital. Consequently, a molecular and biochemical analysis of them is required in order to interpret them scientifically. The huge industrial uses and economic significance of *Calotropis* have made it a unique relevance in India.

Keywords: Herbal medicine; *Calotropis gigantea*; Phytochemicals; Antioxidants; Polyphenolic components; Therapeutic benefits; Pharmacological effects; Economic significance

INTRODUCTION

Calotropis gigantea is a big shrub with several branches. The shrub has cottony, white hairs all over its branches. It also provides milky latex. One of the six species of *Calotropis* weed that is a member of the Apocynaceae family and has numerous medical uses is *Calotropis gigantean* [1]. Many possible medical uses exist for the plant's edible parts, including its latex, bark, flowers, leaves, and roots. Table 1 summarises the plant's profile. This plant, often called "milkweed," is native to China, Malaysia, and India and can be found practically anywhere in the world. In addition to being used as an abortion aid in folk medicines, latex is a common wound-healing substance used by traditional healers [2]. In the past, the pharmaceutical industry has depended heavily on naturally occurring components from plants and animals to provide lead compounds for the creation of innovative medications and treatments [3]. The search for novel pharmacologically active compounds in natural resources such as plants, animals, and microorganisms has yielded several clinically useful drugs. Nonetheless, current research suggests that this plant has medicinal benefits. Thus, in order to shed light on the many little-known and undiscovered medicinal benefits of the plant leaves, the current study attempts to collect data on the phytochemical and biological activities of the extracts of this plant (Figure 1). *Calotropis gigantean* is a popular study material for scientists worldwide due to its pharmacological characteristics, which include anti-diabetic, anti-toxin, anti-hepatotoxin, antioxidant, and wound-healing capabilities [4,5].

Figure 1. *Calotropis procera* is a species of flowering plant in the family Apocynaceae.

Table 1. Plant overview: *Calotropis gigantean*.

Plant overview
Plant name: *Calotropis gigantea*
Family name: Apocynaceae
Synonyms: *Calotropis procera*, *Calotropis acia*
Common name: Giant milkweed, crown flower, aakh
Parts used: Barks, leaves, flowers
Classification kingdom: Plantea
Subkingdom: Tracheobionata
Superdivision: Spermatophyta
Division: Magnoliopsida
Subclass: Asteridea
Order: Gentianales

Family: Apocynacea
Subfamily: Asclepiadoideae
Genus: *Calotropis*
Species: *gigantea*, *procera*, *acia*

MATERIALS AND METHODS

Plant collection and extraction

The fresh leaves of the *Calotropis gigantea* plant were picked. The leaves were given a water flow and then left to air dry. The fresh leaf was next studied pharmacognostically, which involved morphological and phytochemical evaluation. Sections of the midrib and portion of the lamina were removed from leaf specimens and cut into rectangles. The leaf specimens were preserved by embedding them in paraffin blocks. They were then exposed to dehydration, infiltration, and sectioning. The parts were then photographed and stained. Air-dried leaves were processed into a powder for use in medicine using a homogenizer. The leaf powder and its extracts in different solvents were assessed under both standard daylight and UV light (254 nm) conditions. The methods developed by Chase and Pratt were used to measure the fluorescence [6].

Method of extraction

Using a Soxhlet device, the extraction was carried out one after the other. Petroleum ether, diethyl ether, chloroform, ethyl acetate, ethanol, and distilled water were used in succession to extract about 25 g of powdered material. The solvent in the thimble was extracted until it became clear. Following each extraction, the extract was vacuum-dried at a temperature below 45°C to remove the solvent. The yield percentages of distilled water extract, petroleum ether, diethyl ether, ethanol, and chloroform were noted. Until their biological activities were examined, the extracts were kept in a refrigerator at 4°C.

Phytochemical analysis

The powdered medication was subjected to quantitative examinations, which involved measurements of its physiochemical constants and a preliminary phytochemical screening [7]. *Calotropis* is a huge, bushy shrub with leaves that are decussate, obovate, coriaceous, auriculate, and have extraaxillary, umbellate, panicale, purple corolla, and erect lobes [8]. According to morphological research, the leaves are subsessile, measuring 6-15 cm by 4.5-8 cm, and can be broadly oval, ovate-oblong, elliptical, or obovate. They are pubescent while they are young and glabrous on both sides when they mature.

RESULTS AND DISCUSSION

Due to their therapeutic qualities, medicinal plants are being investigated as a potential alternative source of therapeutic chemicals. Many researchers have documented the use of *C. gigantea* for therapeutic purposes, and it is widely accessible in both agricultural and non-agricultural settings.

For approximately six hours, the 1 g of powdered *Calotropis gigantea* leaves were maintained at 500°C in the muffle furnace after being weighed. A total amount of ash was determined. Several phytochemical characteristics were assessed when the ash was dissolved in alcohol, acid, and water (Table 2). Table 3 displays the fluorescence of *Calotropis procera* leaf powder in various solvents. Based on the colour creation or precipitation with the sample, a chemical approach was used for qualitative phytochemical screening. Table 4 presents a tabulation of the acquired results.

Table 2. The ash was dissolved in alcohol, acid, and water.

Type of ash	Ash value (%)
Total ash	18.3
Acid-insoluble ash	1.6
Water-soluble ash	1.9

Table 3. The fluorescence of *Calotropis procera* leaf powder in various solvents.

Treatment	Under visible light	U.V. light (short wavelength; 254 nm)
Powder as such	Green	No change
Powder + 1N NaOH (aqueous)	Light green	Green
Powder + 1N NaOH (ethanolic)	Pale green	Light green
Powder + 1N HCl	Green	Green
Powder + 50% HNO_3	Brown	Green

Table 4. Tabulation of the acquired results.

Phyto chemicals	Petroleum ether extracts (60-80°C)	Chloroform extracts	Ethanol extracts	Water extract
Alkaloids	–	–	–	–
Sugars	–	–	+	–
Phenols	–	+	+	+
Flavonoids	–	–	+	–
Saponins	–	–	–	+
Steroids	+	–	+	–
Terpenoids	–	+	+	–
Tannins	+	–	+	+
Fatty acids	–	–	–	–
Glycosides	+	+	+	+
'+' = Presence of the compound; '–' = Absence of compound				

Phytochemical screening

The plant's phytochemical parameter values can be utilised as markers for authenticity and to guarantee the quality of the powder form, hence preventing the risk of adulteration and substitution. The methanolic extract of *Calotropis gigantea* leaves contained glycosides, flavonoids, tannins, terpenoids, alkaloids, and steroids, according to the study, which was consistent with the findings of the ethanolic extract of the chosen plant. According to research, there were flavonoids, glycosides, and sterols in the aqueous extract that was similar to my study, as well as sterols, glycosides, and carbohydrates in the ethanolic extract and chloroform extract [9-12].

CONCLUSION

Pharmacological screenings of *C. gigantea* have identified a number of phytochemical compounds, including proteins, terpenoids, carbohydrates, alkaloids, glycosides, tannins, flavonoids, phenols, quinones, and coumarins. Ethnomedicinal research has drawn a lot of interest recently since it has revealed many hidden and unknown health benefits, particularly those derived from plants. Consequently, this plant can be a useful medicinal plant and has a lot of therapeutic potential. Aside from its therapeutic benefits, *Calotropis gigantea* grows easily and requires minimal maintenance.

Despite *Calotropis gigantea*'s many medicinal uses, further research is still needed to standardise the phytochemicals and unidentified compounds in this plant, identify a new powerful molecule that suppresses a variety of pathological disorders, and create a new class of drug therapies that will improve human health. Pharmacologists and researchers are currently looking for ways to incorporate natural sources into allopathic medications. In the future, *Calotropis gigantea* leaves' phytochemical, antibacterial, antifungal, and antioxidant properties may aid in the creation of superior medications. Consequently, they are highlighting how this herb has helped establish modern medicine. This research further demonstrated that the manufacture of contemporary medications with fewer side effects may benefit greatly from the use of these ethno-

medical practises. For *C. gigantea* to be conserved and to be used more profitably and therapeutically, systemic research and development efforts should be made.

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