

**BIOACTIVE PHYTOCHEMICAL PROFILING OF CALOTROPIS GIGANTEA: A
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ABSTRACT

The phytochemical composition and antimicrobial activity of *Calotropis gigantea* (Apocynaceae family), a medicinal plant commonly employed in traditional Ayurvedic, Unani and Siddha systems, are examined in this study. Plant parts such as leaves and flowers were collected from the same geographical area. The ethanolic extracts were subjected to qualitative and quantitative phytochemical analysis. Phytochemical analysis such as Alkaloids, flavonoids, glycosides, tannins, phenols, terpenoids and saponins were found in ethanolic extracts using standard qualitative screening techniques. This study sought to quantify the alkaloids, flavonoids, tannins and saponins found in ethanolic extracts of various plant sections. Standard quantitative procedures were utilized to calculate and compare the phytochemical contents of the extracts. The findings provide a comparative profile of the bioactive elements found in the various plant portions, helping to comprehend their potential biological and pharmacological importance.

KEYWORDS: *Calotropis gigantea*, phytochemical compositions, quantitative and qualitative analysis.**1. INTRODUCTION**

Peoples were relied on the plants for their medical needs. Nearly thousands of years, highly developed traditional medical systems have been based on plants sources, which continue to offer innovative treatments to humanity.^[1] The plants with medicinal benefits are used to treat illnesses, avert disease and preserve and enhance health. Based on the research, it is proven that the traditional medicine is both safe and effective.^[2] According to the World Health Organization, for primary healthcare around 80% of people rely on traditional medicines worldwide, in which the majority comes from the plant extracts. Especially in the country like India, the AYUSH (Ayurveda, Unani, Siddha and Homeopathy) accounted for over 95% of prescriptions.^[3]

Calotropis gigantea (L.) also known as Akada, Aak, Mandar and Aakh, which has two species: *calotropis procera*(CP) and *calotropis gigantea*(CG). *Calotropis gigantea* is the subject of this investigation., belongs to the Apocynaceae family.^[4] It contains numerous phytochemicals such as flavonoids, alkaloids,

triterpenoids, saponins, steroids and glycosides. In Ayurvedic medicine, *C. gigantea* was used to cure epilepsy, leprosy, snake bites and cancer.^[5] Different components of the plant are used to cure various disorder, such as treating convulsions using fresh leaves. The bark was used to make diaphoretic medicines and its latex was utilized to cure skin problems.^[6] Researchers reported that, the components of the plant like leaf, roots, flower and latex extracts have antibacterial and antifungal properties.^[7] This article shows, the results of the phytochemical (both quantitative and qualitative) analysis and antimicrobial activity of the leaf and flower from the *calotropis gigantea* plant.

2. MATERIALS AND METHODS USED**2.1. Sample collection**

The whole plant of *Calotropis gigantea* was collected from the area around Komarapalayam bypass, Erode district, Tamil Nadu, India. The required specimen from the collected CG plant is leaf and flowers for this study. The leaves and flowers were selected for the study. It was authenticated by the botanist Dr. G. Gnanasekaran is an

Assistant Professor in the Department of Botany at Madras Christian College (MCC) in Tambaram, Chennai.

2.2. Preparation Methods

The collected leaves and flowers of *Calotropis gigantea* were shade dried at room temperature for 3 – 4 days. The pedicels were removed from the flower, the dried leaf and flowers were grinded into fine powder.

2.3. Phytochemical Analysis of *Calotropis gigantea*

The extracted powder was split into two different samples as CG Leaf and CG flower. The each sample were named as CGL (*C.gigantea* Leaf) and CGF (*C.gigantea* flowers). The samples CGL and CGF was selected for the phytochemical analysis. The samples were prepared using ethanol solvent.

2.4. Preparation of ethanol extract

For the preparation of ethanolic extracts, 10 grams of samples of CGL and CGF were mixed with 100 ml of ethanol and placed on a shaker for 24 hours. The extracts were then filtered through whatman No. 1 filter paper and the filtrate were used for further analysis.

3. Qualitative Analysis of *Calotropis gigantea*

The following common techniques were used to evaluate the plant extracts for the presence of phytochemical analysis. A preliminary qualitative screening of different phytoconstituents, including alkaloids, flavonoids, phenols, phloba-tannins, saponin, tannins, terpenoids and glycosides, was performed on the extracts of *Calotropis gigantea* leaves and flowers.

3.1. Test for Alkaloids

A few drops of diluted hydrochloric acid were added to around 2 ml of the ethanol extract. The presence of alkaloids was determined by adding two to three drops of Mayer's reagent to the filtrate and watching for the formation of a creamy white or pale yellow precipitate.

3.2. Test for Glycosides

The ethanolic extracts were subjected to test for glycosides. 2 ml of the ethanol extract and diluted hydrochloric acid were combined, heated in a boiling water bath for 5–10 minutes. After cooling it was neutralized with diluted sodium hydroxide and equal volume of Fehling A & B was added and the mixture was heated again. The production of a brick-red precipitate was monitored.

3.3. Test for Saponins

The ethanolic extracts were subjected to the water foam test for saponin detection. 2 ml of each extract and 5 ml of distilled water were added in a test tube and violently shaken for 30s and allowed to stand. The tube was looked for foam/froth production which indicates the presence of saponins.

3.4. Test for Phenol

The ethanolic extracts were subjected to test for phenol using ferric chloride test. 2ml of each extract were added with two to three drops of neutral 5% ferric chloride (FeCl_3) solution in a test tubes. The tube was looked for development of a deep green to blue-black colouration.

3.5. Test for Terpenoids

The Fehling's test was used to identify terpenoids. The ethanol extract was added with 2 ml of chloroform in a test tube. A separate lower layer was created by carefully adding concentrated sulfuric acid. The presence of terpenoids was observed by the reddish-brown colouration.

3.6. Test for Tannins

The ferric chloride test was used to identify. 2 ml of ethanol extract and 2 to 3 drops of a neutral 5% ferric chloride (FeCl_3) solution were added in the test tubes. The appearance of blue-black or greenish-brown colour indicates the presence of tannins.

3.7. Test for Quinine

The alkaline reagent test was used to identify quinine. 2 ml of ethanol extract were added with a few drops of diluted sulfuric acid followed by adding bromine water drops until formation of a permanent yellow colour. 1 ml of a diluted ammonia solution was added to the same extract and wait for the presence of emerald green colour.

3.8. Test for Flavonoids

A small piece of magnesium ribbon and a few drops of concentrated hydrochloric acid were added to a 2 mL of the ethanol extract. After letting the mixture rest for a few minutes, the presence of flavonoids was detected by looking for growth of a pink, crimson red, or reddish-orange colour.

4. Quantitative Analysis of *Calotropis gigantea*

4.1. Estimation of Alkaloid

1 ml of Dragendorff's reagent was added to the ethanol extract to detect an alkaloid precipitate. A UV-Visible spectrophotometer was used to detect the absorbance at 435 nm. The precipitate was separated, dissolved with nitric acid and diluted with distilled water. The standard calibration curve was used to determine the total alkaloid content.

4.2. Estimation of Flavonoids

1 ml of Aluminum trichloride reagent was added to the ethanol extract and allowed to sit at room temperature. A UV-visible spectrophotometer was then used to detect the absorbance at 415 nm. The quercetin (QE) standard calibration curve was used to determine the total flavonoid concentration.

4.3. Estimation of Tannins

1 ml of Folin-ciocalteu reagent was added to the ethanol extract, followed by adding sodium carbonate solution.

The mixture was incubated at room temperature and the absorbance was measured at 765 nm using a UV–Visible spectrophotometer. The tannic acid equivalent (TAE) standard calibration curve was used to determine the total tannin concentration.

4.4. Estimation of Saponins

1 ml of Vanillin-sulfuric acid reagent was added to the ethanol extract and the mixture was incubated to allow colour development. A UV-visible spectrophotometer was used to detect the absorbance at 544 nm. The standard calibration curve was used to determine the total saponin content.

5. RESULTS AND DISCUSSION

The collected plant sample were dried and ground into fine powder and the metabolite extraction was performed with ethanol as the solvent system. The qualitative phytochemical screening of the extract shows that diverse bioactive metabolites were present in the extract of *Calotropis gigantea* leaves and flower samples. The flower and leaf extracts showed positive reaction to presence of metabolites such as alkaloid, flavonoid, tannins, saponin, phenols and terpenoids by the color change in addition to the respective reagents, which was displayed in table I.

Table I: Qualitative analysis of calotropis gigantea leaf and flower.

S.NO	PHYTOCHEMICAL	METHOD	CGL	CGF
1	Alkaloid	Mayers Test	+	+
2	Glycosides	Fehling's Test	-	-
3	Saponins	Water Test	+	+
4	Phenol	Ferric Chloride	+	+
5	Terpenoids	Fehling's Test	+	+
6	Tannins	Ferric Chloride	+	+
7	Quinine	Alkaline Reagent	-	-
8	Flavonoid	Shinoda test	+	+

CGL: *Calotropis gigantea* Leaf, **CGF:** *Calotropis gigantea* Flowers, +: Positive, -: Negative

The differences in the concentration of the metabolites were analysed with the help of quantitative assays which was tabulated in the table no. II. The total alkaloid content was found to be 2.13% and 3.64% (w/w) in the leaf and flower extracts respectively. In contrast the leaf extract showed higher flavonoid content 68.10 mg/g than the flower extract which was found to be 30.76 mg/g, also the tannin content was higher in the leaf extract than the flower which was 65.0 mg/g and 30.64 mg/g respectively.

These differences demonstrate that the metabolites were not uniform in the different part of the same plant (Jamal et al., 2025). In the estimation of saponin, it was found that the higher saponin content was found in flower (70.14mg/g) than the leaf extract which was only 3.48mg/g. The result of CG goes in hand with the results of Chailom et al. 2026 where different parts of the same plant have different phytochemical composition especially, he addressed the flavonoid content.

Table II: Quantitative analysis of calotropis gigantea leaf and flower.

S.NO	PHYTOCHEMICAL	METHOD	CGL	CGF
1	Total Alkaloid	UV- Visible Dragendorff method	2.13% (w/w)	3.64% (w/w)
2	Total Flavonoids (QE)	Aluminium trichloride method	68.1 mg/g	30.76 mg/g
3	Total Tannins (TAE)	Folin-Ciocalteu reagent	65.0 mg/g	30.64 mg/g
4	Total Saponins	Vanillin-Sulfuric Acid Method	3.48 mg/g	70.14 mg/g

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