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Phyto, Physicochemical Standardization and TLC fingerprinting of Medicinal Plant *Couroupita guianensis*

Raja S[1], Ravindranadh K[1]

***Corresponding author:**

S. Raja

[1]GITAM Institute of Pharmacy, GITAM University, Visakhapatnam- Andhra Pradesh, India-Pincode-530 045

Abstract

The aim of the study is to cover the pharmacognostical and preliminary phytochemical screening of *Couroupita guianensis*. *Couroupita guianensis* belonging to the family Lecythidaceae, a widely grown plant throughout India. The plant has many valuable medicinal properties. The plant was collected from the local regions and was authenticated by the botanist. Pharmacognostical study included macroscopical characters, microscopical characters, physico-chemical constants and fluorescence analysis. Preliminary phytochemical screening includes phytochemical extraction, phytochemical testing and thin layer chromatography (TLC). While performing the successive solvent extraction, the maximum extractive value of 8.2% was seen in methanol extract. Preliminary phytochemical studies show the presence of carbohydrates, flavonoids, alkaloids, tannins, proteins and amino acids. Performing TLC of chloroform and ethyl acetate extracts using different solvent system, alkaloids, steroids, and flavonoids were identified. The study helps in the correct identification of the herb. The presence of alkaloids, steroids and flavonoids explains that the plant must have valuable medicinal properties which must be explored.

Keywords: *Couroupita guianensis*, Cannonball tree, Physicochemical, Phytochemical, Standardization.

Introduction

Quality can be defined as the status of a drug that is determined by identity, purity, content and other chemical, physical, or biological properties, or by the manufacturing processes. Quality control is a term that refers to processes involved in maintaining the quality and validity of a manufactured product. For the quality control of a traditional medicine, the traditional methods are procured and studied, and documents and the traditional information about the identity and quality assessment are interpreted in terms of modern assessment.

Cannonball Tree is a deciduous tree. Native to tropical South America (particularly Guyana and Surinam) it has large, apricot-pink and gold flowers with an unusual, lopsided arrangement of central stamens and a penetrating fragrance. The taxonomical classification of *Couroupita guianensis* was mentioned in Table 1. It is a really wonderful tree doesn't grow branches that reach out from the straight trunk; it bears vast, showy flowers, with 3" to 5" waxy aromatic smelling growing directly on the bark of the trunk (cauliflower). In Buddhist culture in country these flowers had a special significance. The tree additionally produces orbicular brown woody, indehiscent; double fleshy fruits of associate degree astonishing size, adequate to the scale of an individual's head. The fruit includes of little seeds in an exceedingly white, unpleasant smelling edible jelly. Size of a mature fruit is 24 cm in diameter, weight of a mature fruit-1450 gms, and weight of the shell (fruit rind) from a fruit-545 gms. It's wide planted in tropical and sub-tropical biology gardens as a decorative throughout the tropics and sub tropics, it will well below cultivations. This plant is listed as a rare tree and flower in Republic of India, by a preferred decorative in Caribbean and SE Asian biology gardens.

More recent ethno pharmacological studies show that *Couroupita guianensis* is used in many parts of the world for the treatment of a number of diseases, e.g. as an anti-inflammatory [1], analgesic, [2], antioxidant [3], antimicrobial [4], anti-ulcer [5], antipyretic, [6] anxiolytic [7], hypertension, caries, skin infections, odontalgia, wounds, pain relief and reducing fever. Some of the countries with a long history of traditional medicinal use of *Couroupita* include Mexico and other South American countries including the Guyana and Surinam. For the useful application of the plant parts in modern medicine, physico-chemical and phytochemical standardization is very important, so that the medical benefits of the plant may be used properly and scientifically and reach to the larger populations of the world. Therefore, in the present research work was to evaluate the physicochemical parameters and phytochemical constituents of the whole plant of *Couroupita guianensis.*

Table1. Taxonomical classification of *Couroupita guianensis*

Kingdom	Plantae
Sub kingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Order	Lecythidales
Family	Lecythidaceae
Genus	*Couroupita*
Species	*Couroupita guianensis* Aubl
Synonyms	*Couratori pedicellaris, Couroupita acreensis, Couroupita antillana, Couroupita froesii, Couroupita surinamensis, Couroupita idolica, Couroupita membranacea, Couroupita peruviana, Couroupita saintcroixiana, Couroupita surinamensis, Couroupita venezuelensis, Lecythis bracteata, Pekea couroupita.*
Other names	Arbre a bombes (French), Bala de canon (Spanish), Boesi (Dutch), Carrion tree, Kanonenkugelbaum (German) and Taparon (German).

Figure 1: *Couroupita guianensis* flower

Materials and Methods

Collection of Plant Material

The plant material was collected from Tirupati (Andhra Pradesh) and further identified, confirmed & authenticated by Dr. Madavchetty, Professor, Botany department, Sri Venkateswara University, Tirupati. Voucher specimen No (GIP-Plant No-001) has retained in GITAM Institute of Pharmacy, GITAM University.

Preparation of plant material

The collected *Couroupita guianensis* whole plant was washed with tap water. The plants were cut in to small pieces and air-dried thoroughly under shade (at room temperature) for 2 months to avoid direct loss of phytoconstituents from sunlight. The shade dried materials were powdered using the pulverizer and sieved up to 80 meshes. It was then homogenized to fine powder and stored in air-tight container for furthers analysis

Physicochemical Investigations

Loss on drying / Moisture content (Gravimetric determination):

Separately place about1.0g of whole plant powder of the *Couroupita guianensis*, in an accurately weighed moisture disc. For estimation of loss on drying, it was dried at 105 C for 5 hours in an oven (Memmert), cooled in a desiccator for 30 minutes, and weighed without delay. The loss of weight was calculated as the content of in mg per g of air -dried material.

Determination of total ash

Two grams of the whole plant powder of the *Couroupita guianensis*, was placed in a previously ignited (350 C for 1 hour) and tarred crucible accurately weighed. Dried material was spread in an even layer in the crucible and the material ignited by gradually increasing the heat to 550 C for 5 hours in a muffle furnace (Nabertherm) until it is white, indicating the absence of carbon. Cooled in desiccators and weighed. Total ash content was calculated in mg per g of air-dried material.

Determination of acid-insoluble ash

Twenty- five (25) ml of hydrochloric acid (70g/l) TS was added to the crucible containing the total ash, covered with a watch-glass and boiled gently for 5 minutes. The watch-glass was rinsed with 5 ml of hot water and this liquid added to the crucible. The insoluble matter was collected on an ash less filter -paper (Whatmann 41) and washed with hot water until the filtrate was neutral. The filter -paper containing the insoluble matter was transferred to the original crucible, ignited by gradually increasing the heat to 550 C for 3 hours in a muffle furnace (Nabertherm) to constant weight. Allowed the residue to cool in a suitable desiccator for 30 minutes, and then weighed without delay. Acid-insoluble ash content was calculated as mg per g of air dried material.

Determination of water-soluble ash

Twenty- five (25) ml of water was added to the crucible containing the total ash, covered with a watch glass and boiled gently for 5minutes. Insoluble matter was collected on an ash less filter -paper. Washed with hot water and ignited in a crucible for 15

minutes at a temperature not exceeding 450 C in a muffle furnace. Allowed the residue to cool in suitable desiccators for 30 minutes, and then weighed without delay. The weight of the residue was subtracted in mg from the weight of total ash. Water - soluble ash content was calculated as mg per g of air-dried material.

Determination of sulfated ash

Ignited a suitable crucible (silica) at 550 C to 650 C for 30 minutes, cooled the crucible in a desiccators (silica gel) and weighed it accurately. One gram of the whole plant powder of the *Couroupita guianensis* was placed in a previously ignited crucible, ignited gently at first, until the substance was thoroughly white. Cooled and moistened the sample with a small amount (usually 1 ml) of sulfuric acid (1760 g/l) TS, heated gently at a temperature as low as practicable until the sample is thoroughly charred. After cooling, moistened the residue with a small amount (usually 1 ml) of sulfuric acid (1760 g/l) TS, heated gently until white fumes were no longer evolved, and ignited at 800 C + 25 C until the residue is completely incinerated. Ensure that flames were not produced at any time during the procedure. Cooled the crucible in a desiccators (silica gel), weighed accurately. This was repeated until the sample reaches a constant weight and calculated the percentage of residue.

Determination of pH range

The pH of different formulations in 1% w/v (1g: 100ml) and 10% w/v (10g: 100ml) of water soluble portions of whole plant powder of *Couroupita guianensis* were determined using standard simple glass electrode pH meter [8].

Determination of hot water and ethanol-extractable matter

Separately place about 4.0g of whole plant powder of the *Couroupita guianensis*, in an accurately weighed, glass toppered conical flask. For estimation of hot water -extractable matter, 100ml of distilled water was added to the flask and weighed to obtain the total weight including the flask. The contents were shaken well and allowed to stand for 1 hour. A reflux condenser was attached to the flask and boiled gently for 1 hour; cooled and weighed. The flask was readjusted to the original total weight with distilled water and it was shaken well and filtered rapidly through a dry filter. Then 25ml of the filtrate was transferred to an accurately weighed, tarred flat-bottomed dish (Petri disc) and evaporated to dryness on a water-bath. Finally, it was dried at 105 C for 6 hours in an oven, cooled in desiccators for 30 minutes, and weighed without delay. Same procedure was followed using ethanol instead of distilled water to determine extractable matter in ethanol. The extractable matter was calculated as the content of in mg per gm of air -dried material.

Preparation of Extracts

Couroupita guianensis plant was refluxed successively with the different solvents like petroleum ether, chloroform, ethylacetate and methanol in a Soxhlet extractor for 72hrs in batches of 500g each. Every time, the marc was dried before extracting with the next solvent. The excess solvents were removed from all the extracts by vacuum rotary flash evaporator. Further the solvents were concentrated over the hot water bath and finally stored in desiccators for phytochemical analysis.

Preliminary Phytochemical Screening

The preliminary phytochemical screening of the petroleum ether, chloroform, ethylacetate and methanol extracts of whole plant powder of *Couroupita guianensis* were carried out using standard laboratory procedures, to detect the presence of different secondary metabolites (phytochemical constituents) such as alkaloids, flavonoids, saponins, glycosides, tannins, phenols, terpenoids, steroids, protein, quinines, Fixed oils and fats [9-13].

Test for Alkaloid

Mayer's test: 1.2ml of extract was taken in a test tube. 0.2ml of dilute hydrochloric acid and 0.1 ml of Mayer's reagent were added. Formation of yellowish buff colored precipitate gives positive test for alkaloid.

Wagner's test: 2ml of extract solution was treated with dilute hydrochloric acid and 0.1ml of Wagner's reagent. Formation of reddish brown precipitate indicated the positive response for alkaloid.

Test for Tannins: About 2ml of the aqueous extract was stirred with 2ml of distilled water and few drops of $FeCl_3$ Solution were added. Formation of green precipitate was indication of presence of tannins.

Test for Saponins: 5 ml of aqueous extract was shaken vigorously with 5ml of distilled water in a test tube and warmed. The formation of stable foam was taken as an indication of the presence of saponins.

Test for Flavonoids: To 1ml of aqueous extract, 1ml of 10% lead acetate solution was added. The formation of a yellow precipitate was taken as a positive test for flavonoids.

Test for Terpenoids: 2ml of the organic extract was dissolved in 2ml of chloroform and evaporated to dryness. 2ml of concentrated sulphuric acid was added and heated for about 2 min. Development of a greyish colour indicates the presence of terpenoids.

Tests for glycosides

Borntrager's test: Few ml of dil. sulphuric acid added to the test solution. Boiled, filtered and extracted the filtrate with ether or chloroform. Then organic layer was separated to which ammonia was added, pink red color was produced in organic layer.

Legal test: Extract was dissolved in pyridine; sodium nitroprusside solution was added to it and made alkaline. Pink red color was produced

Test for carbohydrates: The test solution is combined with a small amount of Molisch's reagent (-naphthol dissolved in ethanol) in a test tube. After mixing, a small amount of conc. sulfuric acid is slowly added down the sides of the sloping test-tube, without

mixing, to form a layer. A positive reaction is indicated by appearance of a purple ring at the interface between the acid and test layers indicated that presence of carbohydrates.

Test for Proteins & amino acids

Ninhydrin test: Freshly prepared 0.2% Ninhydrin reagent (2 drop) was treated with extract and heated. A blue color developed indicating the presence of proteins or peptides or amino acids.
Biuret test: 1 ml of 40% NaOH mixed with 2 drops of 1% copper sulphate to the extract, a violet color indicated the presence of proteins.

Tests for steroids

I. A red colour produced in the lower chloroform layer when 2 ml of organic extract was dissolved in 2ml of chloroform and 2ml concentrated sulphuric acid was added in it, indicates the presence of steroids.
II. Development of a greenish colour when 2ml of the organic extract was dissolved in 2 ml of chloroform and treated with sulphuric and acetic acid indicates the presence of steroids.

Thin Layer Chromatography

TLC plates were prepared by using Silica Gel-GF 254 as adsorbent. 20gm silica gel-G was mixed with 40ml of distilled water (1:2) to make slurry. The slurry was immediately poured into the plates. Plates were then allowed to air dry for one hour and layer was fixed by drying at 110^0C for one and half hours. Using a micropipette, about 10µml of extracts were loaded gradually over the plate and air dried. The plates were developed in different solvent systems such as chloroform (100), dichloromethane: methanol (9:1), benzene: pyridine: formic acid (72:18:10), methanol: chloroform (1:9) chloroform: methanol (9:1), benzene: ethyl acetate (95:5). The different solvent systems showed different R_f value for the same plant extract. The chromatograms were observed under visible light and were photographed. The R_f value was obtained by using the following formula.

$$R_f = \frac{\text{Distance travelled by the solute (cm)}}{\text{Distance travelled by the solvent (cm)}}$$

Results

Organoleptic evaluation

As seen in Table2, both the marketed formulation and household formulation had similar organoleptic properties except for the colour of the both formulation. The organoleptic characters of the Whole plant of *Couroupita guianensis* course powder was tabulated as Table No. 2

Table 2: Organoleptic properties of whole plant of *Couroupita guianensis*

Parameters	Marketed formulation	In house preparation
Appearance	Powder	Powder
Colour	Yellowish green	Yellowish Brown
Odour	Fragnant	Fragnant
Taste	Bitter	Bitter

Physicochemical Investigation

Physicochemical parameters of whole plant powder of *Couroupita guianens* were estimated based on the methods recommended by World Health Organization (WHO). As apparent from Table 3, Percent weight loss on drying or moisture content value was found to be 10.25 ± 0.33. The less value of moisture content of drugs could prevent content bacterial, fungal or yeast growth through storage [14]. The ash values total ash; water soluble ash, acid insoluble ash and sulfated ash value were found to be 08.16 ± 0.09, 02.75 ± 0.08, 01.89 ± 0.07 and 01.30 ± 0.10 respectively. Ash values used to find out quality, authenticity and purity of unsophisticated drug and also these values are important quantitative standards [15]. The pH of 1% w/ v and 10% w/ v solutions were found to be 05.12 ± 0.02 and 04.87 ± 0.04 respectively. These values
were showed not much difference in the pH of water soluble portions of whole plant of *Couroupita guianens*. The solubility percentage of *Couroupita guianens* in aqueous hot extraction is higher (37.21 ± 1.27) when compared with ethanolic hot extraction (24.2 ± 0.64). The extractive values are valuable to estimate the chemical constituents present in the crude drug and furthermore assist in evaluation of definite constituents soluble in a particular solvent [16].

Table 3: Physicochemical Parameters of Whole Plant of *Couroupita guianens*

PARAMETERS	VALUES
Loss on drying	10.25 ± 0.33
Total ash value	08.16 ± 0.09
Water soluble ash	02.75 ± 0.08
Acid insoluble ash	01.89 ± 0.07
Sulfated ash value	01.30 ± 0.10
pH of 1% w/v formulation solution	05.12 ± 0.02
pH of 10% w/v formulation solution	04.87 ± 0.04
Water soluble (hot) extractive value	37.21 ± 1.27
Ethanol soluble (hot) extractive value	24.92 ± 0.64

Determination of systemic solvent extractive values

The air dried powder of *Couroupita guianensis* plant was extracted by successive extraction with a variety of solvents. The average yield (% w/w) obtained during extraction with petroleum ether, chloroform, ethyl acetate, and methanol was found to be 3.8, 4.2, 6.0 & 8.2 respectively. The average yield during successive extraction of *Couroupita guianensis* plant with four different solvents was tabulated as Table No. 4

Preliminary phytochemical screening of *Couroupita guianensis*

It was observed that the preliminary phytochemical screening of *Couroupita guianensis* showed the presence of carbohydrates, glycosides, proteins, triterpinoids, and saponins in petroleum ether extract. Chloroform extract revealed the presence of carbohydrates, proteins, alkaloids, steroids, phenolics, glycosides, steroids and tannins. Ethylacetate extract showed the presence of carbohydrates, proteins, alkaloids, glycosides, steroids and flavonoids, while the methanolic extract showed the presence of proteins, alkaloids, glycosides, steroids, triterpinoids, saponins, tannins and flavonoids. The Preliminary phytochemical screening for various functional groups is tabulated as Table No. 5

Table 4: Successive extraction of *Couroupita guianensis* plant

Type of extract	Amount of extract (gm)	Yield (% w/w)	Appearance
Petroleum ether	19	3.8	Yellowish black
Chloroform	21	4.2	Greenish brown
Ethyl acetate	30	6.0	Brownish black mass
Methanol	41	8.2	Brownish mass

Table 5: Phytochemical screening of petroleum ether, chloroform, ethylacetate and methanol extracts of Whole Plant of *Couroupita guianens.*

S.No	Tests	Petroleum ether extract	Chloroform extract	Ethyl acetate extract	Methanol extract
1	Test for carbohydrates				
	Molisch's test	+	+	+	-
2	Test for proteins and amino acids				
	Ninhydrin test	+	+	+	+
	Biuret test	+	+	+	+
3	Test for alkaloids				
	Mayer's test	-	+	+	+
	Wagner's test	-	+	+	+
4	Test for fixed oils and fats				
	Spot test	-	-	_	-
5	Test for glycosides				
	Borntrager's test	+	+	+	+
	Legal test	+	+	+	+
6	Test for Steroids				
	Liebermann burchard test	-	+	+	+
	Salkowski's test	-	+	+	+
7	Test for Triterpinoids				
	Tin+thionyl chloride	+	-	_	+
8	Test for phenolics and tannins				
	Ferric chloride test	-	+	-	+
	Gelatin test	-	+	-	+
	Lead acetate test	-	+	-	+
	Alkaline reagent test	-	+	-	+
9	Test for Saponins				
	Foam test	+	-	-	+
	Haemolysis test	+	-	-	+
10	Test for Flavones and flavonoids				
	Shinoda test	-	-	+	+
	With NaOH	-	-	+	+

(+) Positive (-) Negative

Table 6: Alkaloids: TLC Studies for Chloroform extract of *Couroupita guianensis*

Solvent system for Chloroform extract of *Couroupita guianensis*	Spraying reagent	Colour of spots	R_f value	Inference
Chloroform (100) for chloroform extract of *Couroupita guianensis.*	Methanol : Ammonium hydroxide (200:3)	Voilet colour	0.09	Presence of alkaloids
Dichloromethane: Methanol (9:1) for chloroform extract of *Couroupita guianensis.*	Iodine vapours	Yellow fluorescence	0.74	Presence of alkaloids

Thin Layer Chromatography

It was observed that Thin Layer Chromatography analysis of *Couroupita guianensis* plant showed the presence of alkaloids & steroids in chloroform extract. On another hand ethyl acetate extract showed the presence of flavonoids. R_f values of solutes separated from the various extracts of *Couroupita guianensis* was tabulated as Table No. 6, 7 & 8.

It was observed that the thin layer chromatography analysis of *Couroupita guianensis* chloroform extract showed the presence of alkaloids with R_f values of 0.09 & 0.74 in chloroform (100) & dichloromethane: methanol (9:1) solvent systems respectively. Methanol: ammonium hydroxide (200:3) & Iodine vapours were applied for the detection of alkaloids. Appearance of violet colour and yellow fluorescence indicated the presence of alkaloids in chloroform extract.

Table 7: Steroids: TLC Studies for Chloroform extract of *Couroupita guianensis*

Solvent system for chloroform extract of *Couroupita guianensis*	Spraying reagent	Colour of spots	R_f value	Inference
Benzene: Ethyl acetate (95:5) for chloroform extract of *Couroupita guianensis*	Iodine vapors	Yellow zone	0.46	Presence of steroids
Chloroform: Methanol (9:1) for chloroform extract of *Couroupita guianensis.*	UV-light	Intense fluorescence	0.52	Presence of steroids

The thin layer chromatography analysis of *Couroupita guianensis* chloroform extract showed the presence of steroids with R_f values of 0.46 & 0.52 in benzene: ethyl acetate (95:5), chloroform: methanol (9:1) solvent systems correspondingly. Iodine vapours & UV-light were applied for the detection of steroids. Appearance of yellow zone and intense fluorescence indicated the presence of steroids in chloroform extract.

Table 8: Flavanoids: TLC Studies for Ethyl acetate extract of *Couroupita guianensis*

Solvent system for ethylacetate extract of *Couroupita guianensis*	Spraying reagent	Colour of spots	R_f value	Inference
Methanol: chloroform (1:9) for ethyl acetate extract of *Couroupita guianensis.*	Iodine vapours	Yellow colour	0.62	Presence of flavonoids
Benzene: pyridine: formic acid (72:18:10) for ethylacetate extract of *Couroupita guianensis.*	Liebermann-Burchard reagent	Dark colour	0.24	Presence of flavonoids

The thin layer chromatography analysis of ethyl acetate extract of *Couroupita guianensis* showed the presence of flavonoids with R_f values of 0.82 & 0.98 in Methanol: chloroform (1:9), Benzene: pyridine: formic acid (72:18:10) solvent systems correspondingly. Iodine vapours & Natural products- poly ethylene glycol reagent (NP/PEG) were applied for the detection of flavonoids. Appearance of orange yellow colour and dark colour indicated the presence of flavonoids in ethyl acetate extract.

Discussion

Plants are significant source of potentially bioactive constituents for the improvement of new chemotherapeutic agents. The first step towards this goal, whole plant of *Couroupita guianensis* was subjected to systematic organoleptic evaluation, physicochemical and phytochemical screening to determine the amount of soluble constituents in a given amount of medicinal plant material and are helpful in determining the quality and purity of a crude drug, especially in the powdered form.

As seen in Table 2, both the marketed and house hold formulation of whole plant of *Couroupita guianensis* had similar organoleptic properties except for the colour of the both formulation.

Physicochemical parameters of whole plant powder of *Couroupita guianens* were estimated based on the methods recommended by World Health Organization (WHO). As apparent from Table 3, Percent weight loss on drying or moisture content value was found to be 10.25 ± 0.33. The less value of moisture content of drugs could prevent content bacterial, fungal or yeast growth through storage. The ash values total ash; water soluble ash, acid insoluble ash and sulfated ash value were found to be 08.16 ± 0.09, 02.75 ± 0.08, 01.89 ± 0.07 and 01.30 ± 0.10 respectively. Ash values used to find out quality, authenticity and purity of unsophisticated drug and also these values are important quantitative standards. The pH of 1% w/ v and 10% w/ v solutions were found to be 05.12 ± 0.02 and 04.87 ± 0.04 respectively. These values were showed not much difference in the pH of water soluble portions of whole plant of *Couroupita guianens*. The solubility percentage of *Couroupita guianens* in aqueous hot extraction is higher (37.21 ± 1.27) when compared with ethanolic hot extraction (24.2 ± 0.64). The extractive values are valuable to estimate the chemical constituents present in the crude drug and furthermore assist in evaluation of definite constituents soluble in a particular solvent. The average yield during successive extraction of *Couroupita guianensis* plant with four different solvents was tabulated as Table No. 4

As seen in Table 5, it was observed that the preliminary phytochemical screening of *Couroupita guianensis* showed the presence of carbohydrates, glycosides, proteins, triterpinoids, and saponins in petroleum ether extract. Chloroform extract revealed the presence of carbohydrates, proteins, alkaloids, steroids, phenolics, glycosides, steroids and tannins. Ethylacetate extract showed the presence of carbohydrates, proteins, alkaloids, glycosides, steroids and flavonoids, while the methanolic extract showed the presence of proteins, alkaloids, glycosides, steroids, triterpinoids, saponins, tannins and flavonoids. These constituents may be possibly responsible for the biological activities of *Couroupita guianensis*.

As seen in Table 6, 7, 8 all the extracts were subjected to thin layer chromatography by using different solvent systems. The TLC profiling of all the extracts in chloroform (100), dichloromethane: methanol (9:1), benzene: pyridine: formic acid (72:18:10), methanol: chloroform (1:9) chloroform: methanol (9:1), benzene: ethyl acetate (95:5) solvent systems confirms the presence of diverse potent bio molecules in these plants. TLC analysis provide an idea about the polarity of various chemical constituents, in a way such that compound showing high R_f value in less polar solvent system have low polarity and with less R_f value have high polarity. These potent biomolecules can be further used for development of different drug in future

Conclusion

The pharmacognostical study which includes macroscopy, microscopy, physico chemical constants and Thin layer chromatography analysis gives valuable information. The preliminary phytochemical studies show the presence of carbohydrates, flavonoids, alkaloids, glycosides, tannins, proteins and amino acids. The generated information of the present study will provide data which is helpful in the correct identification and authentication of this medicinal plant and may help in preventing its adulteration.

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Conflict of interest

No

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