RESEARCH ARTICLE OPEN ACCESS

Pharmacognostic, Physicochemical Analysis and Phytochemical Screening of the Leaves of *Gmelina Arborea Roxb (Lamiaceae)*

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ABSTRACT

In this investigation, the phytochemical content of leaf extracts from *Gmelina arborea* Roxb. *(Lamiaceae)* will be screened for and quantified. The *G. arborea* ethanolic extract and aqueous extract were subjected to qualitative secondary metabolite screening and quantitative flavonoid, phenol screening. A phytochemical analysis revealed the presence of tannins, coumarins, alkaloids, and carbohydrates. Moisture content, total ash value, water, and acid insoluble value are revealed through pharmacognostic research. Value extracted as well as alcoholic and water-based extracts, respectively. Through early phytochemical analysis, the presence of alkaloids, flavonoids, carbohydrates, tannins, saponins, and terpenoids were confirmed in all different types of extracts. To conclude, this study could be used as a diagnostic tool for the standardization for this medicinal plant and will be helpful in the characterization of the crude drug.

KEY WORDS: Moisture Content, Ash Value, Extractive Value, Foreign organic matter, Phyto chemical screening, Physico chemical constant

INTRODUCTION

Gambhari (*Gmelina arborea*, Roxb) is a member of the *Lamiaceae* family. Up to a height of 5000 feet, the deciduous tree known as gambhari can be found scattered in deciduous forests in parts of India and the Andaman Islands; its branchlets are tomentose. Petioles up to 12.5 cm long, leaves up to 20 15 cm long, delta-ovate, acuminate at apex, subcordate and slightly decurrent at base, glabrous above, tomentose beneath. Flowers emerge in terminal tomentose panicles or in tiny cymes of 1-3 flowers each on bare branches or when immature leaves are present. 5mm long and tomentose calyx. Up to 4 cm long, pubescent, brownish-yellow corolla. When ripe, ovoid or pyriform, and drizzle yellow. The fruits, flowers, and leaves of *G. arborea* are used as diuretics, to cure anaemia, leprosy, and male sexual dysfunction, as well as to alleviate headaches and stomach ulcers [1-5]. Microscopic, physicochemical, and phytochemical traits are used to categorize medicinal plant components. Different strategies are used to standardize crude pharmaceuticals while taking into account their diverse origins and chemical makeup. There are always enough differences between plants of the same type or distinct types to warrant analysis based on examination of physical and phytochemical traits, regardless of the plants' type. This work aims to define the *Gmelina arborea* standardization parameters. Carbohydrates, Proteins, Saponins, Alkaloids, Flavanoids, Tannins & Phenolic and Steroids & Triterpeneswere all found throughout the phytochemical screening. These discoveries will be helpful in developing pharmacognostic standards for this plant's identification, purity, and quality, which are becoming more important in plant medication development.

MATERIAL AND METHODS

Plant Material

Leaves of *G.arborea* were collected from Pampady, Thrissur, Kerala. The plant was identified, authenticated and certified by Dr. Madiga Bheemalingappa, Scientist, Forest Botany Department, KSCSTE-Kerala Forest Research Institute, Peechi, Thrissur, Kerala.

Organoleptic Evaluation

Organoleptic evaluations were performed according to colour, size, odor and taste parameters.[6]

Physicochemical analysis

1) Moisture content

After precisely weighing the leaf powder, put around 10g of it on a tar-coated evaporating plate. Place the medicine, let it dry at 105 °C for 5 hours, then weigh it. Continue drying and weighing every hour until the difference in weight between any two measurements is no greater than 0.25 percent. When two successive weighs after drying for 30 minutes and cooling for 30 minutes in a desiccator showed a variation of no more than 0.01g that is considered constant weighing. [7].The result was shown in Table.2

$$\textbf{\textit{Moisture content}} = \frac{\textbf{\textit{Fresh weight}} - \textbf{\textit{dry weight}}}{\textbf{\textit{Fresh weight}}} \times \mathbf{100}$$

2) Ash value

Ash values are used to assess the identity, quality, and purity of a crude medication as well as to identify any foreign inorganic substances that may be present as contaminants. Ash contains inorganic radicals like phosphates, carbonates, and sodium, potassium, magnesium, and calcium silicates, among others, that are present in a specific crude medicine in a specific proportion.Different types of Ash values are total ash, acid insoluble ash and water soluble ash.[8]The result was shown in Table.2

3) Extractive value

Macerated 5 grams of coarsely powdered air dried leaves of *G. arborea*, with 100 ml ethanol or water in a stoppered flask for 24 hours, with occasional shaking during the 1st 6 hours and allowed to stand undisturbed for another 18 hours, filtered rapidly, by taking precautions against loss of alcohols. The 25 ml of the filtrate was evaporated to dryness in a tarred flat bottomed shallow dish, dried at 105˚C and weighed. Calculated W/W ethanol soluble extractive with reference to air dried material.[9,10]The result was shown in Table.2

4) Foreign organic matter

A plant sample weighing between 100 and 500 grams was weighed and thinly laid out. The alien substance was found. After being divided and weighed, the amount of foreign substance was calculated.[11].The result was shown in Table.3

EXTRACTION

Procedure

The leaves were shade dried and coarsely powdered. Around 30g of dried powder was weighed, moistened with the selected solvent and packed in the Soxhlet extractor and was then extracted by using 500 ml ethanol separately for 5 hours. After that, the extracts were put via a Whatmann No. 1 filter paper and concentrated. The extracts obtained were then subjected to qualitative and quantitative phytochemical analysis. Extraction of leaves is done by Cold maceration technique.[10].

Percentage yield of extracts

About 100ml of extract were recovered after extraction. Using Whatmann No. 1 filter paper, filtered. Drying was done on concentrated and leftover extracts. Determine the yield percentage.[12].The result was shown in Table.4

Phytochemical screening

The presence of chemical components in the freshly produced extract of various leaves was qualitatively examined. They identified by Characteristic colour changes and precipitation reactions using standard procedures.[6].The result was shown in Table.5

QUALITATIVE SCREENING OF PHYTOCHEMICALS

Determination of Total Flavonoid Contents (TFC)

A modified version of the aluminium chloride technique was used to generate TFC .100 ml of 10% aluminium chloride, 100 l of 1M potassium acetate, and 4.3 ml of DW were added to 0.5 ml of Gmelina arborea different extract (1 mg/ml), which was then incubated at 25 °C for 30 minutes. After incubation, the absorbance at 415 nm

(Microprocessor-Vis double beam; Li-2800) was measured in comparison to a blank containing 5 ml of extraction solvent using a spectrophotometer. Two different analyses of the samples were performed. Using a standard curve based on quercetin concentrations of 10–60 g/ml, the TFC in various extracts was estimated. The results were expressed as milligrams of quercetin equivalent (mg QE/g) dry extract.[13]The result was shown in Table.6

Determination of Total Phenol Content (TPC)

Folin-Ciocalteu reagent was used to perform TPC on various G. arborea leaf extracts.500 l of diluted Folin-phenol (optimized 1:4 with DW) and 2.5 ml of 20% sodium carbonate were combined with 1 ml of the extracts (1 mg/ml). The solution was thoroughly sorted, allowed to develop color for 40 minutes in the dark, and then measured spectrophotometrically at 725 nm. A calibration curve was made using Gallic acid, and linearity was attained between 10 and 60 g/ml. Milligrams of Gallic acid equivalents (mg GAE/g) were used to express the final results.[14]The result was shown in Table.6

RESULTS

Organoleptic Characteristics

Sl.No	Organoleptic Characters	Nature
1	Colour	Dark green
2	Size	7-12 cm length&7-13 cm width
3	Odour	Characteristics and slightly disagreeable
4	Taste	Bitter

Table.1. Organoleptic Characteristics

Physicochemical Parameters

SL. No	Physicochemical constant	Result(%W/W)
I.	**Moisture content**	12.55%
II.	**Ash value**	
1.	Total ash	0.05
2.	Water soluble ash	0.05
3.	Acid insoluble ash	0.0
III.	**Extractive value**	**Result(%W/W)**
1.	Ethanol Soluble Extractive value	10.14
2.	Water Soluble Extractive value	6.03

Table.2.Physicochemical Parameters

Determination of foreign organic matter

Parameter	Percentage yield(%W/W)
Foreign organic matter	1.2

Table.3.Foreign organic matter

Percentage yield of solvent extracts

SL.No	Extracts	Yield(%w/w)
1	Ethanol	19.36
2	Water	26.3

Table.4.Percentage yield of Solvent extract

Phytochemical screening

Chemical constituents	*Ethanol extract*	*Water extract*
Carbohydrates	++	++
Proteins	--	++
Saponins	++	++
Alkaloids	--	--
Flavanoids	++	--
Tannins & Phenolic	++	++
Steroids & Triterpenes	--	--

Table.5.Phytochemical screening. [-- = Presence, ++ =Absence]

Quantitative Screening of Phytochemicals

Sample Extracts	**Total Flavanoids Content (mg/g)**	**Total Phenol content(mg/g)**
Ethanolic extract of *G. arborea*	11.242± 0.021	26.679± 0.0015
Water extract of *G. arborea*	8.843± 0.0185	20.202± 0.00587

Table.6.Quantitative Screening of Phytochemicals

DISCUSSION

Studies of Physicochemical characterization can be a useful source of knowledge and are frequently used to assess the quality and purity of the medicine. The extractive value provides insight on the drug's chemical make-up. Alcohol had the highest extraction value in the current investigation, followed by water. The amount of earthy or inorganic materials and other contaminants in the medicine are determined by its ash value. In this work, the pharmacognostic standard for *G. arborea* leaves is established for the first time.

CONCLUSION

To conclude, this research will be useful in defining the characteristics of the crude medicine and could be a diagnostic tool for standardizing this medicinal plant. This study also came to the conclusion that leaves contain numerous phytochemicals with therapeutic potential, such as carbohydrates, proteins, saponins, alkaloids, flavanoids, tannins and phenolic acids, steroids, and triterpenes. To identify, classify, and define the structure of the bioactive chemicals present that were responsible for the powerful pharmacological actions, more research on the extracts is currently being conducted.

CONFLICT OF INTEREST

Authors declare no conflict of interest

ACKNOWLEDGEMENT

The authors acknowledging Nehru College of Pharmacy, Pampady, Thiruvilwamala, Thrissur, Kerala for providing all the support.

REFERENCES

1. http://www.bsienvis.nic.in/medi.htm#Gmelina%20arbore a.
2. Khare CP. Indian herbal remedies: rational Western therapy, Ayurvedic, and other traditional usage, botany. Springer. 2004, 236.
3. Khare CP. Indian Medicinal Plants: An Illustrated Dictionary, Springer. 2007, 291
4. Chkraborty M, Kaswala R, Patel V, Kamath JV. Phytochemical and Pharmacological profile of *Gmelina arborea*: An overview. IRJP. 2012; 3:61-64.
5. Unnikrishnan KP, Raja S, Remashree AB, Balachandran I. Occurrence of gmelinol in stem bark of *Gmelina arborea* Roxb: Aryavaidyan. 2007; 21:34-37.
6. AkshadaG.Waghchaure,RavindraS.Jadhav,Dattaprasad N. Vikhe,Yogeshwari,L.Ghule.Areviem Pharmacognostic ,Phytochemical and Biological Potential of Gmelina Arborea Roxb(Shivan Plant).International journal of Research and Review.March 2022.9(3)237-248.
7. A.Lakshmana Rao, D.S.N.B.K.Prasanth, J.SaiSowmya, N.Teja, B .Pujitha, SaiManikumar, G.OohaDeepika, K.Bhargavi. Pharmacognostic study of Mansoa alliacea. International Journal of Research in Ayush and Pharmaceutical Sciences.2019; 3(10).

8. ManasaK,ShrikanthP,RavikrishnaS,SuchithraPrabhu.Pharmacognostic and phytochemical study of leaf of Gambhari (Gmelina arborea Roxb). International Ayurvedic Medical Journal .July,2017.5(7).
9. Illa Patel, Sufura sipai. Phytochemical studies on Mansoa alliacea (Lam.),International journal of Advances in Pharmaceutical Research. 2013; 6; 1823-1828.
10. D. S. N. B. K. Prasanth, S. K. Aminabee, Atmakuri Lakshmana Rao, NayaduTeja, KotiBhargavi, Chirugupati Monika, BoppudiPujitha,TeraSandhya, AgastyaLalitha, Siva Prasad Panda. Anthelmintic activity of Mansoa alliacea against Pheretimaposthuma: Invitro and in silico approach. Thai Journal of Pharmaceutical Sciences.2020; 44(3); 186-196.
11. Dr. Jyoti Markam, Dr. R.K.Singh, Dr.P.K.Joshi, Dr. NehaSoni, Dr.Lalchand, Phytochemical study of Hydroalcoholic extract of Mansoa alliacea (Lam.) leaf. Journal of Ayurveda and Integrated Medical Sciences. 3(5);2018;70-75
12. Devang Pandya, Vishal Patel, Tusharbindu Desai, NiraliChaniyara, MitalSankhavara and VaishaliKoyani. Pharmacognostic and phytochemical evaluation of aerial parts of Bignonia alliaceae. International Journal of Pharmacy & Life Sciences. 2012; 3(1); 1339-1344.
13. Kalita, P. Tapan, B.K.; Pal, T.K.; Kalita, R. Estimation of Total Flavonoids Content (TFC) and Anti-Oxidant Activities of Methanolic Whole Plant Extract of BiophytumSensitivum Linn. J. Drug Deliv. Ther. 2013, 3, 33–37.
14. Siddhuraju, P.; Becker, K. Antioxidant Properties of Various Solvent Extracts of Total Phenolic Constituents from Three Different Agroclimatic Origins of Drumstick Tree (MoringaOleifera Lam.) Leaves. J. Agric. Food Chem. 2003, 51, 2144–2155.

