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ARTICLE

EVALUATION OF PHYTOCONSTITUENTS IN LEAF EXTRACTS OF *GMELINA ARBOREA*

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Abstract

Gmelina arborea Roxb. is a fast growing deciduous tree native to tropical Asia. This plant belongs to the family, Verbenaceae. In India, it is called 'Gambhar' in Hindi, 'Kumbil' in Malayalam and White teak in English. It is widely used in most of the Indian traditional medical systems including Ayurveda, Siddha and Unani owing to their varied medicinal properties. The leaves of *G. arborea* were used in the present study. The leaves are often used as a demulcent, carminative and an antidote. The dried plant material was subjected to Soxhlet extraction using various organic solvents and evaluated for the phytoconstituents present in them. The yield analyses were carried out for each of the successive solvent extracts. The leaf extracts were further evaluated qualitatively for 9 phytochemicals as per standard protocols. Analyses revealed the presence of characteristic chemical groups in different solvent extracts. Thus, the present study provides evidence that leaf extracts of G. arborea contains medicinally important bioactive compounds and this justifies the use of the plant species as a traditional medicine for treatment of various diseases.

Keywords: *Gmelina arborea*, Leaves, Soxhlet extraction, Phytoconstituents.

Introduction

India has one of the oldest and richest cultural traditions associated with the use of medicinal plants. Many of these medical traditions have been documented in the form of thousands of medical texts and manuscripts and such traditional knowledge forms the codified systems of medicine which exists in the forms of Ayurveda, Unani and Siddha systems. *Gmelina arborea* is one such plant that is widely used in different Indian traditional systems of medicine. It is a moderately sized to large deciduous tree, native to tropical asia. The Leaves are deltoidovate up to 20 ×15cm ,acuminate at apex, subcordate and slightly decurrent at base, glabrous above, tomentose beneath; petioles upto 12.5cm long. Flowers on the naked branches or appearing with the young leaves, in small cymes of 1-3 flowers each, arranged in terminal tomentose panicles. Calyx c.5mm long, tomentose. Corolla upto 4cm long, brownish –yellow, pubescent. Drupe yellow when ripe, ovoid or pyriform (Bhat, 2014).

Recent ethnopharmacological studies have suggested that the leaves of *G. arborea* possess antimicrobial (El-Mahmood et al., 2010) and antihelmintic activity (Ambujakshi et al.,2009). They are often used as carminative, in headache, anasarca, asthma, bronchitis, cholera, colic pain, dropsy, epilepsy, throat swelling, urticaria, as antidote to snake bite and some other poisons, cough, gonorrhea. Charaka suggested a paste of the leaves as ingredients of a medicated clarified butter for stiffness of the back, facial paralysis and prescribed the soup of fruits in diarrhoea. A paste of leaf is applied to the head for the relief of headache (Khare 2004, 2007). They are also used in dyspepsia, cephalegia and foul ulcer (Warrier et al., 1994). The juice of leaf is used as foetid discharge, worm from ulcers, demulcent, diabetes and antidote (Kirtikar and Basu,1975; Pandey, 2005). In current study, the authors have made an attempt on the phytochemical analyses of its leaf extracts.

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Materials and Methods

Collection of the plant material:

Fresh plant leaves of *Gmelina arborea* were collected from Botanical garden, Research Department of Botany, Mahatma Gandhi College, Thiruvananthapuram (Kerala). The leaves were washed thoroughly with normal tap water followed by sterile distilled water. Then, they were dried under shaded condition at room temperature. Dried leaves were crushed to powder using grinding machine. Powder was stored at room temperature in tight air container bottle.

Sample preparation for phytochemical screening:

50 gram powdered sample was weighed and taken separately. The leaf powder was subjected to soxhlet extraction in a successive manner using the solvents: Petroleum ether (PE), Chloroform (CH), Ethyl acetate (EA), Ethanol (EO) and Water (AQ) in the order of increasing polarity. After

Table 1. *G. arborea* leaf extractive yield, colour and consistency

Extract	% of Yield	Colour	Consistency
Petroleum ether	2.49 ± 0.12	Dark Green	Solid
Chloroform	2.42 ± 0.32	Dark Green	Solid
Ethyl acetate	2.31 ± 0.25	Dark Green	Solid
Ethanol	17 ± 0.09	Dark Brown	Semi Solid
Aqueous	19.25 ± 0.15	Dark Brown	Solid

Table 2. Qualitative Phytochemical evaluation of the *G. arborea* leaf extracts

Phytochemical	PE extract	CH extract	EA extract	EO extract	AQ extract
Alkaloids	+	+	_	+	+
Flavonoids	_	+	_	+	_
Anthraquinones	_	_	_	_	_
Phenolics	_	+	+	+	_
Tannins	_	+	+	_	_
Terpenoids	_	_	_	_	_
Steroids	_	_	+	_	_
Saponins	_	_	_	_	_
Glycosides	_	_	_	_	_

yielding the extract. Dried extract was stored in refrigerator for their future use in phytochemical analysis.

Determination of the Yield:
The yield of the dried extract obtained from extraction using each solvent was calculate using the following formula:
Yield %=(Weight of the dry extract x 100)/(Weight of the dry leaf powder)

Qualitative Phytochemical Screening:
Chemical tests were carried out on various solvent extracts to identify different phytoconstituents using standard methods of Trease and Evans (1989) and Harborne (1998). The different phytochemicals tested were alkaloids, phenolics, flavonoids, tannins, anthraquinones, glycosides, steroids, terpenoids and saponins.

Results and Discussion

Extraction and Determination of the Yield:

Various solvent extracts of *G. arborea* leaf obtained through the successive soxhlet extraction were collected and dried for further analyses. Analyses of the extraction yield showed that the % yield was comparatively higher in the aqueous (19.25 ± 0.15 %) and ethanolic (17 ± 0.09 %) extracts. The observations made with respect to the colour, consistency and yield are shown in table 1.

Qualitative Phytochemical Screening:
The qualitative analysis of the phytochemicals confirms the presence of constituents which are known to exhibit medicinal as well as physiological activities (Ismaila et al.,2011).

The results revealed the presence of medicinally active constituents like alkaloids, phenolics, flavonoids, tannins and steroids in the leaves of *Gmelina arborea*. While anthraquinones, terpenoids, saponins and glycosides were absent in this plant leaf. Chloroform extract showed the presence of maximum phytochemicals. The presence of steroids was observed only in the ethyl acetate extract while petroleum ether and aqueous extracts indicated the presence of only alkaloids. The qualitative phytochemical characteristics of

the G. arborea leaf extracts investigated are summarized in table 2.

Many alkaloids are known to possess pharmacological activities for the treatment of neurodegenerative diseases such as Alzheimer's disease (Chaves et al., 2016). Phenolics are an important class of secondary metabolites, consist of structurally heterogeneous group ranging from simple phenolic acids to much complex polymeric structure like tannins (Dai and Mumper, 2010). Flavonoids are the most abundant phenolics in plants that exhibit diverse bioactivities mostly due to their antioxidant potential. The plant derived antioxidants are significant due to their ability to inhibit or delay oxidative damages caused during many degenerative diseases (Rice-Evans et al., 1996).

Conclusion

Gmelina arborea leaf extraction gave a maximum yield in the aqueous and ethanolic extracts. Further, phytochemical screening of petroleum ether, chloroform, ethyl acetate, ethanol and aqueous extracts revealed the presence flavonoids, tannins, alkaloids and phenolics by positive reaction with the respective test reagent. The study showed maximum presence of phytoconstituents in chloroform, ethyl acetate and ethanolic extracts. The results obtained in this study thus suggest that the detected phytochemicals may be the bioactive constituents responsible for the efficacy of the leaves of the plant.

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Conflict of Interests

The authors have declared that no competing interest exist.

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