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Physicochemical evaluation and phytochemical investigation of the leaves of *Grewia tiliaefolia* Vahl

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ABSTRACT

The present study was aimed to evaluate physicochemical standardization and preliminary phytochemical investigation of the leaf of Grewia tiliaefolia Vahl belonging to the family tiliaceae. The standardization parameters included determination of foreign matter, loss on drying, ash values, extractive values, fluorescence analysis, preliminary phytochemical screening was performed according to standard procedures. The preliminary identification was done by using Macroscopical observation and final authenticity was done by botanist.

Key words: *Grewia tiliaefolia* Vahl, Tiliaceae, Physicochemical standardization, Phytochemical analysis, Fluorescence analysis.

INTRODUCTION

Grewia tiliaefolia is a medium sized tree up to 20 m in height, with a clear bole length of 8 m and 65 cm in diameter and gray to blackish brown rough fibrous bark peeling off in thin flakes; leaves are simple, alternate. The flowers are yellow, small on thick axillary peduncles and fruits are globose drupes of the size of a pea, 2-4 lobed, black when ripe, seeds 1-2. It is commonly known as Dhamani, Dhaman. It is a well known herb in Ayurvedic system of medicine and has been used in vitiated conditions of pitta and kapha, burning sensation, hyperdipsia, rhinopathy, pharyngopathy, cough, skin diseases, pruritus, wounds, ulcers, hematemesis, and general debility, cancer. *Grewia tiliaefolia* leaves belong to the family Tiliaceae. It is found in India, especially in Punjab, Uttar Pradesh, Chennai, Andhra Pradesh, Mumbai, Pakistan, Southeast Asia, Burma and USA. The leaves stipulate, ovate with oblique base, acuminate, crenate-dentate; flowers small, borne on thick axillary peduncles; drupe globose and of the size of a pea, 2-4 lobed, black and edible. Dhaman is a very close cousin of Phalsa. The yellow flower resembles the true phalsa flower very much. The main difference is in the leaves. The leaves of Dhaman are oblique heart-shaped, a characteristic shared by the Linden trees, which belong to the genus *Tilia*. The botanical name *tiliifolia* means, leaves resembling Tilia [1]. The leaves are applied on skin eruptions and they are known to have antibiotic action. The fresh leaves are valued as fodder. The ether extract of the leaves possesses antibiotic activity. Except for these studies, so further physicochemical and phytochemical investigations have been carried out on this plant. The adsorpetive property has gained more importance now a days because of its involvement in the adsorption of the many constituents of these leaves [2].

Vernacular names:
Common name: Dhaman
Botanical name: *Grewia tiliifolia*

Family : Tiliaceae (Phalsa family)
Hindi : Dhamani
Tamil : Unu
Malayalam : Unnam
Telugu : Cahrachi
Kannada : Todsal
Bengali : Dhamin
Sanskrit :Dhanu vriksha

Fig. 1: Leaves of *Grewia tiliaefolia* natural habitate

MATERIALS AND METHODS

1.1 Plant collection and Authentication

The leaves of *Grewia tiliaefolia* were collected from their natural habitat [3] from the forest of Thirumala hills range, Tirupati Chittore district of Andhra Pradesh on May 2015. The identification and authentication of the plant were done by Dr. K. Madhava Chetty compares with the voucher specimen number 1091 deposited in the Botany department, Sri Venkateswar University, Tirupati. The leaves were immediately washed, shade dried and powdered in a mixer grinder. The powdered plant material was packed in airtight container and stored at room temperature for further study.

1.2 Preparation of leaf extracts, chemicals and reagents

The dried leaf powder of *Grewia tiliaefolia* was extracted successively with the solvent petroleum ether, chloroform, ethyl acetate and ethanol for 24 hours each of Soxhlet apparatus. The extracts were filtered and concentrated at reduced pressure. All the extracts thus obtained, kept in a desiccator for further studies. All the chemicals and reagents used for the present study were analytical grade.

1.3 Development of standard analytical parameters

The powdered samples and extracts of the leaf samples were standardized according to WHO guidelines and other Pharmacopoeial specifications [4]. Physical parameters such as foreign matter, moisture content, loss on drying, total ash value, acid insoluble ash value, water soluble ash value, fluorescence analysis, extractive values in different solvents were analyzed as per the standard official methods [5,6]. Successive hot extraction of leaf powder was carried out in soxhlet extractor by using various solvents of different polarity. Preliminary phytochemical investigation for all extracts was carried out with reference to the standard methods.

1.3.1 Foreign organic matter

Foreign organic matter is the material not coming from the original plant. It includes insects, molds and animal excretions, other parts of the organ or organs from which the original is derived. The results of foreign organic matter for *Grewia tiliaefolia* leaf samples were recorded in the form of % w/w (Table 1).

Table. 1: Foreign matter and microbial infestation of *Grewia tiliaefolia* leaf sample.

Plant	Season	Weight taken (in g)	Foreign matter (% w/w)	Microbial infestation
Grewia tiliaefolia leaf powder	May	100	0.95	Nil

2.3.2 Ash values

The total ash, acid insoluble ash and water-soluble ash values were determined from air-dried samples using the procedure described in the IP. Ash value is used to determine the percentage of inorganic constituents present in the crude drug. These values were helping in determining the quality and purity of a crude drug. The ash of *Grewia tiliaefolia* leaf contains inorganic constituents like carbonates, phosphates and silicates of calcium, magnesium, potassium and sodium, etc. The results of ash values of all samples were stated in Table 2.

Table 2: Ash values of *Grewia tiliaefolia* leaf.

Plant	Season	Total ash (%w/w)	Water soluble ash (%w/w)	Acid-insoluble ash (%w/w)
Grewia tiliaefolia	May	8.4	2.6	1.00

2.3.3 Extractive values

An extractive values of the crude drugs determines the amount of active principles extracted with selected solvents from a particular amount of medicinal plant material/crude drug [7]. For identifying extractive values the air dried, accurately weighed fine powdered drug was extracted with selected solvents like petroleum ether, chloroform, ethyl acetate and ethanol. The extractive values of all leaf samples were reported in Table 3.

Table. 3: Successive solvent extractive values of *Grewia tiliaefolia* leaf with different solvents

Plant	Season	Pet. ether (%w/w)	Chloroform (%w/w)	Ethyl acetate(%w/w)	Ethanol (%w/w)
Grewia tiliaefolia leaf powder	May	1.8	2.9	3.8	30.9

2.3.4 Fluorescence analysis

The dried samples of leaf powder of 1-2 grs were placed on a microscope slide and observed in daylight as well as in UV light (Short UV 254 nm and Long UV 365 nm). All the leaf powdered drug were then treated with different reagents like 10 N sodium hydroxide, 1 N hydrochloric acid, 1N sulfuric acid, 1N nitric acid, ammonia, 5% ferric chloride, acetic acid, 1 N sulphuric acid, 1 N nitric acid and 5% iodine [8, 9,10]. The change in colour was observed and the results were noted (Table 4).

Table. 4: Fluorescence analysis of *Grewia tiliaefolia* leaf powder

Treatment	*Grewia tiliaefolia* leaf powder		
	Daylight	UV Light	
		Short UV (254 nm)	Long UV (365 nm)
Powder as such	Light Yellow	Brown	Yellowish Brown
Powder +10N NaOH	Yellowish Brown	Dark Yellowish Brown	Bluish Brown
Powder + 1N HCI	Light Yellow	Light Brown	Dark Brown
Powder + 1N H2SO4	Light Brown	Brown	Yellowish Brown
Powder + 1N HNO3	Brown	Blackish Brown	Dark Brown
Powder + NH3	Yellowish Brown	Light Brown	Blackish Brown
Powder + 5% FeCI3	Reddish Brown	Light Brown	Blackish Yellow
Powder + acetic acid	Brown	Dark Brown	Blackish Brown
Powder + 5% iodine	Brown	Dark Brown	Blackish Brown

2.3.6 Preliminary phytochemical analysis

The different extracts of powdered leaf of *Grewia tiliaefolia* were subjected to preliminary phytochemical studies to identify the various phytoconstituents like carbohydrates, phenolic compounds, flavonoids, alkaloids, triterpenoids, proteins, saponins, lipids, steroids and tannins using different standard methods (WHO, 2011). The results of preliminary phytochemical screening were stated in Table 5.

Table 5: Preliminary phytochemical screening of different solvent extracts of *Grewia tiliaefolia* leaf powder

Test for	Pet. Ether	Chloroform	Ethyl Acetate	Ethanol
Alkaloids	+	-	-	+
Saponins	+	-	+	-
Tannins	+	-	+	+
Steroids	-	+	+	+
Triterpenoids	+	-	+	+
Flavonoids	-	+	+	+
Proteins	-	-	-	-
Amino acids	-	-	-	-
Carbohydrates	+	+	+	-
Glycosides	-	-	-	+
Quinines	-	-	-	+
Phenols	+	-	+	+

RESULTS AND DISCUSSION

Assurance of safety, quality and efficacy of medicinal plants is of at most importance. To establish identity and purity, criteria such as physical constants, contaminants, moisture, ash content and solvent residues have to be checked. Ash value (8.4%w/w) represents the level of 'cleanness', and high values may be due to inappropriate handling procedures during the sample collection process. Extraction with ethanol (30.9%) gave higher yield than with other solvents. An excess of water in plant materials encourages microbial growth and deterioration following hydrolysis. Therefore, this method is important for determining the quality, purity and standard ness of plant material..

Physicochemical screening of the plant is a preliminary and important aspect of the process of establishing herbal medicine quality. Preliminary phytochemical analysis is helpful in determining the chemical constituents of plant materials. They are also useful in locating the source of pharmacologically active chemical compounds. Preliminary phytochemical revealed the presence of alkaloids, flavonoids, tannins and saponins in leaves of *Grewia tiliaefolia*. The presence of phenolic compounds in the plants indicates that this plant may possess anti-oxidant properties. Aguinaldo *et al*, reported that tannins may possess potential value such as cytotoxic and antineoplastic agents.
The preliminary phytochemical screening of the leaf powder of the plant indicated the presence of several active constituents such as alkaloids, saponins, tannins, steroids, triterpenoids, flavonoids, carbohydrates, glycosides, quinines, phenols, in different solvent extracts. Fluorescence analysis was carried out to fruit powder by using various chemical reagents in day light and UV light (long UV and short UV) for identification of plant material.

CONCLUSION

Suitable parameters for the physicochemical screening and phytochemical characterization have been for *Grewia tiliaefolia* leaf. The various physicochemical parameters like foreign matter, ash values, extractive values, and loss on drying and preliminary phytochemical screening as well as fluorescence analysis supported that these parameters can serve as quality characters and criteria for the evaluation of the identity, quality, purity and authenticity of the plant. Further studies are recommended to isolate and characterize the chemical constituents which may be responsible for the pharmacological activities of the plant.

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