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Suguna M
Department of Biotechnology,
University of Mysore,
Manasagangotri, Mysore,
Karnataka, India

Umesha S
Department of Biotechnology,
University of Mysore,
Manasagangotri, Mysore,
Karnataka, India

Taxonomical review on *Grewia orbiculata* Rottl., an Indian ethno-medicinal plant

Suguna M and Umesha S

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Abstract

In the present scenario, we are encountering many diseases caused by microorganisms, the best example being COVID-19. This has intrigued world to investigate more to find cure. During last two years, we have witnessed lot of research on corona, with combination of plant secondary metabolites like flavonoids, phenols etc. While known research investigations allow extensive studies on already existing medicinal remedies, whereas searching for unexplored flora for entirely new secondary metabolites may result in quick answer and it can be promising. With this background, we have done literature survey and found, plant *Grewia orbiculata* Rottl. Has remained unexplored so far for its therapeutic values. We have penned down the whole information available from authenticated websites, journals and folklore about this plant which can be selected for in-depth analysis for its medicinal value. In this review we have also provided its taxonomical classification, distribution, phytochemical composition, and easy identification of plant.

Keywords: *Grewia orbiculata*, taxonomical classification, phytochemical composition, identification

Introduction

India is a special country blessed with versatile vegetation, from Thar desert to cold desert, from Tropical thorny to tropical wet evergreen forests, from sub-tropical coniferous to tropical deciduous forests etc. This facilitates the existence of umpteen number of flora and fauna. The richness of vegetation is such that, India alone comprises 7 % of the world flora species. Out of the total flora species 28% of them are endemic to our country ^[1]. According to BSI (Botanical Survey of India) majority of these species are concentrated in Himalayan region, the Western Ghats, and Andaman & Nicobar Islands ^[1]. These three regions are among the 34 world's biodiversity hotpots ^[1]. Till date, about 45000 species are identified and classified by Botanical Survey of India ^[1]. Even today the scientists and botanists are searching and identifying new species. In fact, it was reported by BSI, that in the year 2020, 267 new plant species were identified, out of which 202 plant species are new to the world and 65 were never reported from India till date ^[1]. So, India has tremendous asset of vegetation which needs to be explored to derive beneficial usage of these plant species. The well-known Ayurveda and other tribal medical systems have put lot of efforts in learning and implementing the acquired knowledge about these plant species with medicinal value to treat deadly diseases and also to maintain good health. This study continues till date and it is true that, there are many such ethno-medicinal plants which are to be explored. One such endemic plant is *Grewia orbiculata* Rottl. Which grows in dry deciduous forests all over India. Though this plant is identified quite a long ago, very less is known and reported about its medicinal and therapeutic properties. Keeping in mind, the vast variety of *Grewia* species which is indigenous to India that are widely used in folklore and in Indian medical systems, we can also rely on this plant for its potency and to have high medicinal value.

Scientific Classification ^[2]:

Kingdom: Plantae
Division: Angiospermae
Class: Dicotyledonae
Subclass: Polypetalae
Series: Thalamiflorae

Corresponding Author:
Umesha S
Department of Biotechnology,
University of Mysore,
Manasagangotri, Mysore,
Karnataka, India

Order: Malvales

Family: Malvaceae (formerly: Tiliaceae)

Sub family: Grewioideae

Genus: *Grewia*

Species: *Grewia orbiculata*

Field tips ^[1, 3, 6]

- Branchlets rusty-velvety. Leaves 5-nerved from base.
- Leaf Arrangement: Alternate-distichous
- Leaf Type: Simple
- Leaf Shape: Ovate-orbicular
- Leaf Apex: Rounded-obtuse
- Leaf Base: Cordate
- Leaf Margin: Crenate-serrulate
- Flower: Axillary or leaf-opposed cymes
- Fruits: Entire or obscurely 4-lobed drupe, stiff-villous, coppery

Habitat of the plant

The word *Grewia* is named after the person Nehemiah Grew, who was an English plant anatomist and physiologist, and is known as the "Father of Plant Anatomy" ^[3]. *G. orbiculata* is a shrub first identified by Johan Peter Rottler, a French missionary and botanist, which he has documented in his book 'Neue schriften, Gesellschaft Naturforschender Freunde zu Berlin' ^[4, 5]. In the state of Karnataka in India, this plant is very well known to the locals as Karijaana or Javane (Karnataka) and pods of this plants are eaten fondly by them ^[3]. *G. orbiculata* grows in the hilly dry wild terrains close to the villages of Karnataka. The following figures from 1 to 6,

depicts the vegetation, appearance of different parts of the plant and also educates the natural habitat of the plant.



Fig 1: Habitat of *G. orbiculata*. It normally grows in the dry deciduous regions. 1A the distribution of the plant is sparse in its habitat. 1B. branches with pods, depicting the pods of plant, their position and appearance.



Fig 2: Leaves of *G. orbiculata*: The leaf is found to be round and marginally toothed (2A). Ventral part of the leaf, that is velvety in nature (2B). Dorsal surfaces of the leaf are rounded.



Fig 3: 3A. Branch of *G. orbiculata*. Branches are found to be dry and hard. Bark of the plant is dark in colour. 3B. *G. orbiculata* bearing flowers. The figure indicates the occurrence and position of flowers and pods.



Fig 4: Whole plant *G. orbiculata*: From the figure it is evident that this plant grows both as a small plant and a shrub

Taxonomical note on plant *G. orbiculata*, locally collected

G. orbiculata is a small tree or can be an unarmed shrub and can grow up to 4 m tall. The branches are tomentose and which are young found to be soft and velvety. The characteristics of leaves are broadly elliptic or obovate,

obovate-oblong, obovate or nearly round, measuring 3-8.5 x 2-5 cm, 5-nerved, with toothed margin, 5 cm across, orbicular, base cordate, margins minutely serrate, basally, 5-nerved, glabrous above, thinly pubescent below. The ventral surface of the leaves is velvety, and the base or dorsal leaves is rounded. Petiole grow up to 1 cm. They bear flowers which are yellow or greenish-yellow in colour and are either axillary or leaf-opposed cymes are borne in umbel-like cymes. Peduncles measure up to 1.5 cm, pedicels measure up to 8 mm; sepals have dimension of 8x2 mm and are oblong, pubescent; petals measures 4x2 mm, gland are surrounded by hairs; torus are elongated to 2 mm; filaments measures 1.5 mm; ovary is hirsute, style measures 5 mm, stigma is capitate. Stipules grow to 1 cm, lanceolate, pubescent, are lance shaped, falling off. Fruit or pod is round, obscurely 2-lobed or 4-lobed drupe, hairy, stiff-villous, coppery ^[1, 3, 6].

Phenology

Flowers of *G. orbiculata* were bore by the plant during

November-March. The fruiting starts from December onwards [1, 3, 6].

Distribution and habitat

This shrub is indigenous to India, and it is widely distributed all over the country in dry deciduous forest regions such as Bihar, West Bengal, Orissa, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala [6].

Global Distribution

India, Pakistan, tropical Africa, Arabia, Egypt, and E. Indies [6].

Common name

Common name: Round-Leaved *Grewia*, round sage-leaved

Indian linden, Kannada: Karijaana, Tamil: Ney-c-citti, Telugu: Jaana [1, 3, 6].

Synonyms [1].

Grewia rotundifolia Juss [1, 3, 6].

Phytoconstituents and therapeutic properties of *G. orbiculata*

Though studies are carried out with this plant re very less, few scientists have deduced the leaf phytochemical composition. Proximate composition of this plant is tabulated in table 1 [7]. Qualitative analysis and thrombolytic activity of *G. orbiculata* is tabulated in table 2 and 3 as per the reports of [8].

Table 1: Proximate composition of leaves

| Sugar | Non-Reducing sugar | Total sugar | Water | Methanol | Ethanol | Petroleum ether | Chloroform | Acetone | Benzene |
|-------|--------------------|-------------|-------|----------|---------|-----------------|------------|---------|---------|
| 2.1 | 1.1 | 3.2 | 20.44 | 19.61 | 12.6 | 16.6 | 12.6 | 11.4 | 7.48 |

Table 1: Percentage of sugar present and the percentage yield of phytochemicals obtained in each solvent.

Table 2: Qualitative analysis of leaves

| Phytochemical | Extract | | |
|----------------|---------|---------------|----------|
| | Hexane | Ethyl acetate | Methanol |
| Alkaloids | + | - | - |
| Phlobatannins | + | - | - |
| Coumarins | - | - | - |
| Anthraquinones | - | - | - |
| Tannins | - | - | + |
| Glycosides | + | + | + |
| Phytosterols | - | - | - |
| Flavonoids | + | + | + |
| Phenols | + | + | + |
| Saponins | + | - | + |
| Terpenoids | + | + | - |

Table 2: Phytochemicals present in the leaves and it is clear that *G. orbiculata* is found to be rich in flavonoids, phenols, saponins and terpenoids.

Table 3: Thrombolytic activity

| | |
|-----------------------|--------------|
| Hexane extract | 13.876+0.283 |
| Ethyl acetate extract | 25.303+0.213 |
| Methanolic extract | 7.841+0.067 |

Table 3: Thrombolytic activity of different extracts of leaves. Among the three solvents used, phytochemicals extracted using ethyl acetate showed highest thrombolytic activity.

Discussion and Conclusion

The plant *G. orbiculata* seems to be having high medicinal values which can be gauged by the presence of phytochemicals and by its regular usage in folklore. So, this plant requires more advanced studies to be conducted to deduce the phytochemical composition and to isolate the secondary metabolites present in different parts of the plant. We also would like to explore the symbiotic existence of this plant with other organisms like the endophytes which are known to form the galls on leaves of this plant and their role in assisting in its defence mechanism. Further, we have planned to study its potency and activities such as antimicrobial, antioxidant and anticancerous properties along with its own defence mechanism against many bacterial and viral diseases, as we think there is lot of scope in evaluating

the therapeutic values of this plant.

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