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RESEARCH ARTICLE

Pharmacognostic Studies on Leaf of *Tamilnadia uliginosa* (Retz.) Tirveng. & Sastre (Rubiaceae)

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Abstract

Tamilnadia uliginosa (Rubiaceae), is commonly known as 'divine jasmine. Its leaves are simple, obovate, wrinkled, shiny and pubescent. *T. uliginosa* has been widely used for its medicinal and pharmaceutical properties throughout the world. The leaves are also used as the remedy for various diseases. The detailed pharmacognostic study of *T.uliginosa* was carried out because of its potent medicinal activity and rare occurrence. The present investigation deals with the various pharmacognostic studies on the leaves of *T.uliginosa* which include morphological and microscopical characters and powder microscopy analysis. The result of the study provides data for the proper identification of the plant.

INTRODUCTION

More than ever before herbal drugs are in great demand now. There is also a general awareness among the public regarding the safety and efficacy of herbal drugs (Lalitharani *et al*., 2011). Pharmacognosy is the study of the structural, physical, chemical and sensory characters of crude drugs of animal, plant or mineral origin. Pharmacognosy is basically divided into two groups: conventional and modern. Conventional pharmacognosy includes the study of macroscopic and sensory characters (shape, size, colour, texture, surface and odour of powered drug), microscopic characters (anatomical and maceration) and quantitative microscopic characters (vein-islet number, vein-islet termination number and stomatal number).

Phytochemical evaluation detects the presence or absence of bioactive compounds in the crude extracts of plants. Phytochemicals are naturally occurring constituents in the plants, particularly in leaves, (vegetables) and roots. Some have defense mechanisms against various diseases. Phytochemicals include primary and secondary compounds. Chlorophylls, proteins and common sugars are included in primary constituents and secondary compounds are terpenoids, alkaloids and phenolic compounds (Krishnaiah and Sarbatly, 2007).

Tamilnadia uliginosa is a small tree, belonging to the family Rubiaceae.*T.uliginosa* is commonly known as 'divine jasmine. Leaves of the plant are simple, obovate, wrinkled, shiny and pubescent. The detailed study of *T.uliginosa* was carried out because of its potent medicinal activity and rare occurrence. The synonyms of this plant are *Gardenia uliginosa, Catunaregam uliginosa, Randia uliginosa, Gardenia pomifera, Posoqueria uliginosa* (Council of Scientific and Industrial Research, India, 1969). *T. uliginosa* is widely used in Ayurveda, Siddha and Unani medicines. The leaves of the plant are used for various ailments like cholera, diarrhoea, dysentery, eye complaints and pimples. The leaves are also used as a remedy for leprosy, skin diseases, wounds, ulcers, cough, asthma, bronchitis, fever and for relieving colic. The decoction made from the leaves of this plant is used as a remedy for continuous and continual sneezing. Water boiled with the leaves of this plant is good for reducing joint paints. The fruits are eaten boiled or roasted; either alone or together with other vegetables in curries (Quatrocchi, 2012). Considering the medicinal importance of *T.uliginosa*, a detailed pharmacognostical analysis and preliminary screening of the phytochemicals were carried out.

MATERIALS AND METHODS

Fresh leaves of *T. uliginosa* were collected from the Muthanga Wild Life Sanctuary and Kuruva Island. The species for the proposed study was identified and authenticated by Dr. E.S Santhosh Kumar, Jawaharlal Nehru Tropical Botanic Gardens and Research Institute, Thiruvananthapuram, Kerala State following Bentham and Hooker (1892).A voucher specimen of the plant has been deposited in the Herbarium of Department of Botany, University of Kerala, Kariavattom. (KUBH5810). Fresh leaves were washed and used directly for the analysis of macroscopic and microscopic characters. For other analyses, the plant parts were subjected to shade drying for about ten weeks. The dried plant materials were powdered and the powder was passed through a mesh sieve and stored in air tight containers.

1.Macroscopic characters

The macroscopic characters examined during the present study included the morphological features of *T.uliginosa*. The character states included both floral and vegetative morphological features.

2. Micromorphology

At the micro morphological level anatomical characterization was carried out.

2.1 Anatomy

Micro morphological features namely stomatal characters, vein termination number and vein islet number were determined.

2.2. Stomatal characters

a) Stomatal number

In order to study the average number of stomata per square millimeter of leaf epidermis, small pieces of leaves were cleared by boiling with chloral hydrate solution. Upper and lower epidermis were separately peeled out by means of forceps, and mounted on a micro- slide using glycerine and observed under ordinary light microscope. The number of stomata present per square millimetre is counted. The average number of stomata per square millimetre was calculated from a total of ten observations from ten different fields of the microscope.

b) Stomatal index

Stomatal index is the percentage number of stomata as compared to all the epidermal cells including stomata in a unit area of leaf. It is the percentage number of stomata which the number of stomata forms to the total number of epidermal cells, each stomata being counted as one cell. Stomatal index was calculated by using the following equation.

$I = S/E+S \times 100$

Where I = Stomatal index

S = No of stomata per unit area

E = No of epidermal cells in the same unit area

2.3. Determination of vein- islet number and vein let termination number

A vein-islet is the small area of green tissue surrounded by the vein lets. The vein-islet number is the average number of vein-islets per square millimeter of leaf surface. The vein let termination number is defined as the number of vein let termination per square millimetre of the leaf surface, midway between midrib of the leaf and its margin. A vein termination is the ultimate free termination of vein let.

Both the vein-islet number and vein let termination number are determined by counting the number of vein-islets in an area of 4 square millimeter of the central part of the leaf between the midrib and the margin following Parthasarathy (2010).

3. Powder Microscopy

Powdered plant part (leaf) here after called the crude drug was evaluated for characteristics like the colour, odour, taste and nature (Kumar *et al*., 2012).

Result

Macroscopic study

The macroscopic features of T.uliginosa during the present study included both qualitative and quantitative aspects of vegetative and floral characters. These are represented in (Figures. 1-6 and Tables 1-3).

Microscopic features

Transverse section of the leaf showed a single layered upper epidermis with thick cuticle. Mesophyll tissue consisted of compactly arranged single layered palisade and loosely arranged multilayered spongy tissue. Midrib region showed vascular bundles (Fig. 7). Lower epidermis possessed unicellular trichomes. Stomata were present only on lower epidermis. Stomata are anomocytic type (Fig.6). Leaf constants namely leaf size, vein islet

number and vein termination number and details of stomata such as number, frequency and stomatal index are given in Table -1 along with other vegetative characters.

Table 1.Qualitative and quantitative vegetative characters of T.uliginosa

Sl.No.	parameters	Observed characters
1	Habit	Thorny shrub
2	Nature of leaf	Simple, exstipulate
2	Leaf apex	Slightly rounded
3	Leaf base	Attenuate
4	Leaf venation	Brochidodromous
5	Leaf shape	Spatulate
6	Leaf margin	Entire
7	Leaf surface	Smooth
8	Phyllotaxy	Opposite
9	Leaf size	12.42± 62 x 8.09± 32cm
10	Vein islet number	16.3± 33
11	Vein termination number	12.4± 25
12	Stomatal frequency	11±21
13	Stomatal index	26.23±24
14	Stomatal size	1.97±13 x 1.48±12cm

Table 2.Qualitative floral characters of T.uliginosa

Sl.No.	Parameters	Observed characters
1	Inflorescence	Cymose
2	Arrangement and position of flower	Solitary and terminal
3	Type of flower based on no. of floral parts	Pentamerous
4	Symmetry of flower	Actinomorphic
5	Type of flower based on ovary position	Epigynous
6	Sexuality	Bisexual
7	**Calyx** No of sepals Union of margin Colour Aestivation Nature	 5 to 6 Fused at the base Fleshy green Imbricate Persistent in fruit
8	**Corolla** No of petals Union of margin Colour Aestivation	 5 Fused White turning yellow Twisted
9	**Androecium** No of stamens Adhesion No. of thecus	 5 Epipetalous Dithecas

	Anther attachment	Basifixed
10	**Gynoecium** No. and nature of carpels Stigma Nature of style Ovary Ovary position No. of ovules Placentation	 2,united Bilobed Simple Two celled Inferior Numerous Axile
11	**Fruit**	Globose berry
12	**Seeds** Number Nature and texture	 Many seeded Flat, compressed and smooth

Table 3.Quantitative floral characters of T.uliginosa

Sl.No.	Characteristics/parameters	Values
1	Calyx length	1±81 cm
2	Calyx width	3±11 cm
3	Corolla length	2±63 cm
4	Corolla width	1±7 cm
5	Androecium length	2±1 cm
6	Androecium width	1±3 cm
7	Gynoecium length	1±9 cm
8	Gynoecium width	1±3 cm
9	Fresh weight of fruit	30±13 gm
10	Dry weight of fruit	13±07gm
11	Length of fruit	6±53cm
12	Breadth of fruit	3±95cm
13	Diameter of fruit	12±4cm

Powder analysis

On the microscopical examination of the leaf powder of *T.uliginosa* showed trichomes parenchyma, fibers vessels spiral thickening and stone cells. Similar results reported by (Ashok *et al*., 2011).

Fig .1

Fig .2

Fig.3

Fig.4

Fig.5

Fig.6

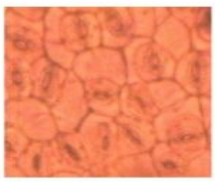

Fig.7

Fig .8

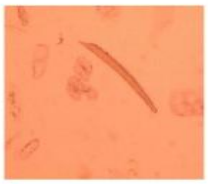

Fig.9

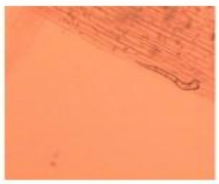

Fig.10

Fig.11

Fig.12

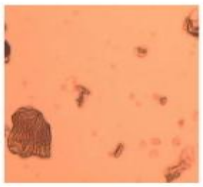

Fig.13

Fig.14

Fig1. Flower, Fig 2. Fresh fruit, Fig3. Dry fruit, Fig 4. Seed, Fig 5. Upper leaf surface, Fig6. Lower leaf surface, Fig7. Stomata, Fig 8. C.S of leaf, Fig.9 Tracheids, Fig.10 Trichome, Fig. 11 Parenchyma, Fig.12 Vessels, Fig.13, Stone cells, Fig. 14 Secondary thickening

DISCUSSION

T. uliginosa is an important medicinal plant because each and every part of it can be used for medicinal purposes. Leaves of *Randia uliginosa* cures abscess, ulcers, inflammations, wounds, and skin diseases (Kokate *et al*., 2010).Sometimes make chutney using the leaves of the plant. Many tribal and rural families of Wayanadu district in Kerala use a wide range of species for their food and medicinal needs (Narayanan et al., 2011). Kattunaikkan community, predominantly distributed in the Wayanad district of Kerala, depend on their traditional knowledge on medicinal plant parts for treating various ailments.

The present study was initiated with a detailed analysis of the external morphological features of *T.uliginosa*, since morphological characterization is considered as the most important tool for proper identification of the plant material. In the present study, morphological, anatomical, physico-chemical, nutritional, elemental and

phytochemical analyses were done to detect the presence or absence of bioactive compounds in the crude extracts of different parts of the target plant. Macroscopic study of *T.uliginosa* will provide useful information for the correct identification of the material. The quantitative and qualitative determination of certain pharmacognostic parameters are useful for setting standards for crude drugs. Parameters such as the stomatal number, stomatal index and vein-termination number are relatively constant for plants and can be used to differentiate closely related species. The type of stomata, stomatal index, frequency and stomatal size were very specific to the particular taxon. The detailed pharmacognostical evaluation gives valuable information regarding morphology and macroscopic characteristics of the crude drugs. It also provides qualitative information regarding the plant.

Conclusion

Phytochemicals are biologically active compounds present in plants used for food and medicine. A great deal of interest has been generated recently in the isolation, characterization and biological activity of these phytochemicals. Pharmacognostic and phytochemical screening can serve as a basis for proper identification of a plant. In the present study, a set of pharmacognostical standardization parameters were studied on *T.uliginosa* and the results obtained were is helpful in standardization and identification of plant as well as crude drug for the future analysis and preparation of drug.

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