



Research Article

ASSESSMENT OF POWDER MICROSCOPICAL STUDIES OF *GREWIA TILIAEFOLIA* VAHL LEAVES

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ABSTRACT

The aim of present investigation includes the collection, authentication of *Grewia tiliaefolia* Vahl leaves and assess powder microscopical features with the help of standard pharmacognostical procedures listed in Ayurvedic pharmacopoeias to establish identity and quality of the powdered form of leaf drug. Collected leaf samples were washed properly, shade dried and powdered in a mixer grinder. The powdered material was taken on microslide, stained with various colouring reagents and observe under microscope for various cellular arrangements. The leaf powder consists of abundant thick-walled fibres with tapering ends. Thick walled rectangular parenchyma cells are seen in leaf powder, these parenchyma cells have 2-4 cross walls. The lamina showing the venation pattern. The vein-islets are polygonal, narrow, thick straight boundaries. The characteristic epidermal trichomes and epidermal glandular trichomes are common in the powder, these are important diagnostic characters to identify the powder form of the drug. The guard cells in the stomata are narrow elliptical with stomatal aperture.

Keywords: *Grewia tiliaefolia* Vahl, Powder microscopy, Fibres, Parenchyma cells, Trichomes, Stomata

INTRODUCTION

Grewia tiliaefolia Vahl belongs to family *Tiliaceae*, is a medium sized plant grows up to 20 mts in height, attaining a clear bole length of 30 ft and 65 cm or more in diameter¹. Gray to dark brown fibrous rough bark appears as peeling off in the thin flakes. Leaves stipulate with simple, ovate having oblique base. The flowers are small yellow with thick axillary peduncles and fruits are drupglobose of the size of a pea with 2-4 lobed, blackish when ripen and fruits are edible, seeds 1-2. *Grewia tiliaefolia* commonly known as Dhaman. *Grewia tiliaefolia* originates in India, especially found in Utter Pradesh, Punjab, Andhra Pradesh, Chennai, Mumbai and also identified from Pakistan, Southeast Asia and in USA. The scientific name *Tiliaefolia* denotes, leaves similar as *tilia*. It is a well-established herb in Ayurvedic system of medicine and has been widely recommended in vitiated situations of kapha and pitta, hyperdipsia, rhinopathy, pharyngopathy, cough, pruritus, ulcers, general debility hematemeses, cancer, skin diseases, wounds and urinary infections².

Medicinal herb materials are systematized based on their organoleptic, macro and microscopic characters. Systematic observation of these characters is the primary tool for establishing purity and identity of medicinal important plant species. These studies should be done before any other investigations are initiated³. Plant species are being generally substituted/adulterated in routine method considering the many facts such as similarity in organoleptic characters, regional name confusion as recorded in classical text references, existence of inferior identical active compounds in substituting/adulterating plant parts and collector insensitivity etc, rise in limited therapeutic property of the formulated dosage form⁴. Morphological examination of a particular crude drug does not give an exact opinion about the identity of crude drug. A well-

established identification is needed in the direction to obtain a good quality of finished phytomedicine.

Powder Microscopy is a dependable practice for powdered form crude drugs by which entire powder microscopic features of the crude drugs can be determined. Accordingly, the comprehensive powdered microscopic investigation of the leaf powder of *Grewia tiliaefolia* Vahl accomplish to provide its purity, identity and quality of the powdered crude drug. The organized drugs are identified by microscopic examination to determine its histological characters and to distinguish possible adulterants^{5,6,7}. The microscopic experiment includes an observation specific morphological part, study of whole plant material or powdered form of crude drugs. For instance, the present study initiating standards for identity, purity and quality of powdered crude drug.

MATERIALS AND METHODS

Leaves of *Grewia tiliaefolia* Vahl were gathered from their natural habitat from the forest of Thirumala hills, Tirupati, Chittore district of Andhra Pradesh on May 2015. The leaves were identified and authenticated by Dr. K. Madhava Chetty and the voucher specimen number 1091 deposited in the Botany department, Sri Venkateswara University, Tirupati. The collected leaves were immediately washed under running tap water and dried in shade. The fully dried leaves were powdered in a mixer grinder. The leaf powder material was packed in a transparent airtight glass container and stored in dark at room temperature for future study.

Chemicals and reagents

All reagents and chemicals used for microscopic study were analytical grade⁸. Phloroglucinol and Toluidine blue were purchased from Sri Ranga Agencies, Lab Chemicals, Kurnool.

Iodine, Safranin, Glycerine and Potassium Iodide were purchased from HI-MEDIA (Mumbai). Mixer grinder is used to get the powder form of crude drug. Different magnifications of microscopic images were captured by the camera (Canon Photo Spot G 3) attached to microscopic unit.

Slide preparation and Mounting

The powder sample was immersed in hot water to remove the air from the tissues. The microscope slide was prepared by placing a small amount of hot powder on the micro slide and then the powdered material was cleared by adding NaOH and the preparation was stained with Toluidine blue⁹. Preparation also treated with Iodine in Potassium Iodide reagent for visualizing

starch particles. Microscopic slide was also treated with Safranin to identify lignified and suberized/cutinized cell walls. All microscopic slides were separately stained with Phloroglucinol and concentrated hydrochloric acid. The slide was mounted by adding a drop of Glycerin and place a cover slip on to the preparation^{10,11,12}.

Photomicrographs

Microscopic observations of various magnifications of leaf powder preparation were taken by Canon Photo Spot G 3 Camera. Different magnifications of microscopic observations are specified by scale bars.

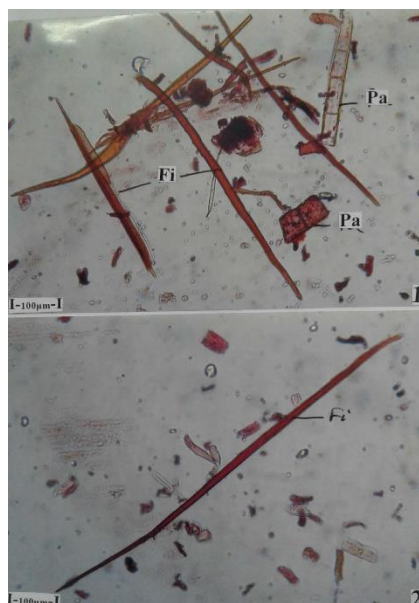


Figure 1: Powder microscopical characters of leaf showing isolated fibres and parenchyma cells (Figure 1.1) and Single fibre (Figure 1.2). (Fi- Fibres; Pa-Parenchyma Strand).

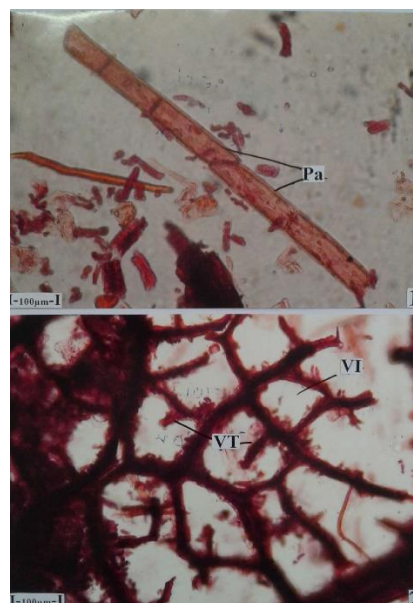


Figure 2: Leaf powder microscopical characters. A Parenchyma strand (Figure 2.1) and venation pattern of the Lamina (Figure 2.2). Pa- Parenchyma Strand; VI- Vein Islet; VT- Vein Termination).

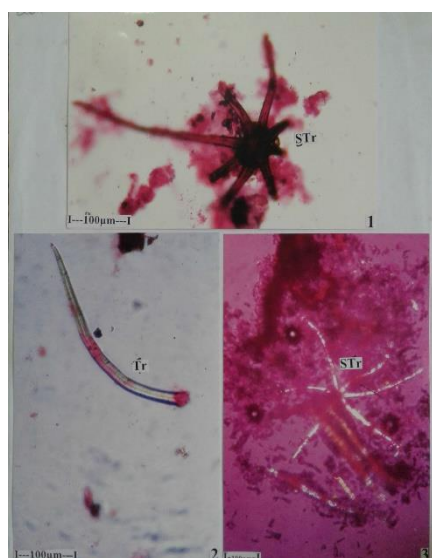


Figure 3: Trichomes in powder. Stellate trichome (Figure 3.1), a single unit of the stellate trichome (Figure 3.2) and a stellate trichome showing lignified walls (Figure 3.3). STr- Stellate Trichome; Tr- A Single Trichome).

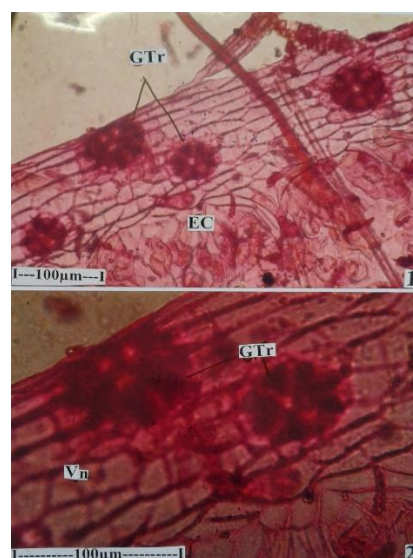


Figure 4: Capitate type of trichomes on the vein-cells (Figure 4.1) and two glandular trichomes enlarged (Figure 4.2). (EC- Epidermal Cells; Tr- Glandular Trichome; Vn- Vein).

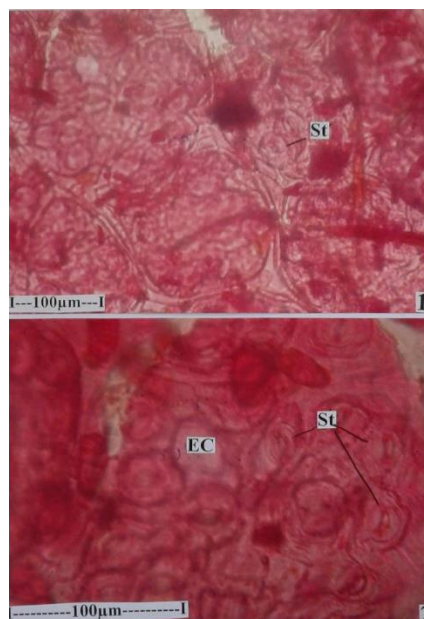


Figure 5: Stomata in the powder microscopy. Stomata on the lamina- surface view (Figure 5.1 and Figure 5.2). (EC- Epidermal Cells; St- Stomata).

RESULTS AND DISCUSSION

Grewia tiliaefolia Vahl leaf powder showing the following powder microscopical features.

Fibres (Figure 1.1, 1.2): Fibres are abundant in the leaf powder of *Grewia tiliaefolia* Vahl. The fibres are thick walled, wide or narrow and have tapering pointed ends. The walls are thick and Lignified. Pits are not evident. The length of the fibres ranges from 600 µm to 1 mm. The thickness of the fibres is 20-30 µm. A single fibre was shown in (Figure 1.2).

Parenchyma cells (Figure 1.1, 2.1): The Parenchyma cells are rectangular wide and thick walled. The cross walls are straight. The cells have 2-4 cross walls (Septa). Some cell inclusions are seen in the cells. The cells are 600 µm long and 50 µm thick.

Venation of the lamina (Figure 2.2): Small fragments of the lamina were seen in the leaf powder of *Grewia tiliaefolia* Vahl. They show the venation pattern. The vein-islets are narrow, polygonal with thick straight vein boundaries. The vein-termination are thick, unbranched or branched.

Epidermal trichomes (Figure 3.1, 3.2, 3.3): Characteristic stellate trichomes are common in the powder. The fibres have a short one-celled stalk which is buried in the epidermis. From the stalk arise four to eight, unicellular horizontally spreading, thin, lignified hairs are present. As seen from above, the complex trichome system appears a star or stellate. The individual trichome is 350 µm long and 15 µm thick.

Epidermal glandular trichomes (Figure 4.1, 4.2): Apart from the stellate non-glandular trichomes, there are circular, plate like peltate trichomes on the epidermal layer of the vein. The circular plate consists of about radiating darkly stained cells. The glands are 50-70 µm in diameter.

Stomata (Figure 5.1, 5.2): Small fragments lamina was cleaned with 10% sodium hydroxide to remove the cell contents. The cleaned fragments were stained and view under the microscope. Surface view of the stomata was seen. Since the stomata were buried in deep stomatal pits, they were not clearly visible. The

guard cells of the stomata are elliptical with narrow stomatal aperture. The stomata are 20x25 µm in size.

CONCLUSION

From the current research, it is concluded that the powder microscopical characters of *Grewia tiliaefolia* Vahl leaf showed significant powder microscopical characters mentioned in standard reference books. These powder microscopical characters will help full in the identity/authenticity of *Grewia tiliaefolia* Vahl in powder form.

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