

Research Article

Pharmacognostic Studies on whole Plant of *Merremia emarginata* Burm. F (Convolvulaceae)

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ABSTRACT

Pharmacognostic evaluation is the first and foremost step to determine identity and to assess the quality and purity of the crude drug. *Merremia emarginata* Burm.f (convolvulaceae) is a perennial, much branched herb (creeper). It is found widely distributed all over the India, especially in damp places in upper gangetic plain, Gujarat, Bihar, West Bengal, Western-Ghats, ascending up to 900m in the hills, Goa, Karnataka in India, Ceylon and Tropical Africa. All the genus of the family are economically important. *Merremia emarginata* is also known as *Ipomoea reniformis chois*. The current study describes some pharmacognostical studies on whole plant of *Merremia emarginata*.

Keyword: *Merremia emarginata*, *Ipomoea reniformis*, Convolvulaceae, Pharmacognosy

INTRODUCTION

Merremia emarginata Burm.f (convolvulaceae) is a perennial, much branched herb (creeper). It is found widely distributed all over the India, especially in damp places in upper gangetic plain, Gujarat, Bihar, West Bengal, Western- Ghats, ascending up to 900m in the hills, Goa, Karnataka in India, Ceylon and Tropical Africa. *Merremia emarginata* is also known as *Ipomoea reniformis chois*. Phytochemical studies reported that *Merremia* or *Ipomoea* contain biologically active chemicals such as p-coumaric acid, ferulic, caffeic, sinapic acid esters and tropane alkaloids. *Merremia emarginata* burm.f whole plant was studied for antioxidant, anti-inflammatory, anticancer, antidiabetes, antipyretic and neurophathy activity. Recently research on this plant about "In vitro antioxidant and antimicrobial activities of *Merremia emarginata* using thio glycolic acid-capped cadmium telluride quantum dots" and "Profiling of phenolic compounds using UPLC-Q-TOF-MS/MS and Nephroprotective activity of Indian green leafy vegetable *Merremia emarginata* (Burm. f.)" were investigated.¹⁻⁷

In the Indigenous system of Medicine, *Ipomoea reniformis* has been claimed to be useful for cough, headache, neuralgia, rheumatism, diuretic, inflammation, troubles of nose, fever due to enlargement of liver and also for treating cancer. Suman Kumari reported the anatomical studies of *Merremia emarginata* (Burm. F.) Hall. F8-11. Present study was aim to investigate the anatomical characteristic of *Merremia emarginata*, to provide opportunities for further studies.

MATERIALS AND METHODS

Collection of Plant materials: *Merremia emarginata* Burm. F whole plant was collected during January & February 2010 from the surroundings of Tirunelveli, Tamilnadu and were botanically identified using Floras, Mayur, Nathan (1929). Further, its identity was confirmed by tallying with herbarium specimens at the plant anatomy research centre, by Prof. Jayaraman, Tambaram, Chennai, Tamilnadu. Morphological features of specimens were studied directly in the field and were photographed under original environment.

Procedure for Anatomical Studies and Staining Methods: Standard methods of sectioning and staining were followed for preparation of semi permanent and permanent slides. The plant materials were collected and fixed in FAA in the field itself. Johansen (1940).

The plant materials were sectioned with rotary microtome after embedding in paraffin wax. Paraffin section in different planes was cut to the thickness of 10-12 μm. For paraffin embedding, the usual procedure of dehydration and cleaning was followed by employing ethyl alcohol and xylol (Johansen, 1940). Sections were stained mostly with safranin - Fast green combination and a few slides were stained with Toluidene blue. All micro measurements were made with the aid of micrometers. Photomicrographs were done on NIKON - Labphot - 2 microscope using Konica color film (100 ASA). Descriptive terms of various observation are as found in ESAU (1977) and Metcalfe and Chalk (1979)12-18.

Powder Microscopic Studies: Well shade dried, chopped crude leaves were powdered, sieved and used for powder organoleptic and microscopic analysis. The powder was stained with safranin and observed through microscope. Starch grains were observed by staining with iodine in



Fig.1: Microscopic Features of Merremia emarginata

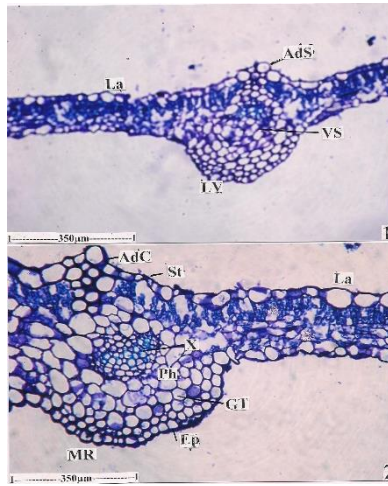


Fig. 2.1: T.S of Leaf through Lateral vein

2.2. T.S of Leaf through midrib (AdS – Adaxial side, Ep – Epidermis, GT – Ground Tissue, La – Lamina, LV – Lateral vein, MR – Midrib, Ph – Phloem, St – Stomata, VS – Vascular Strand, X- Xylem).

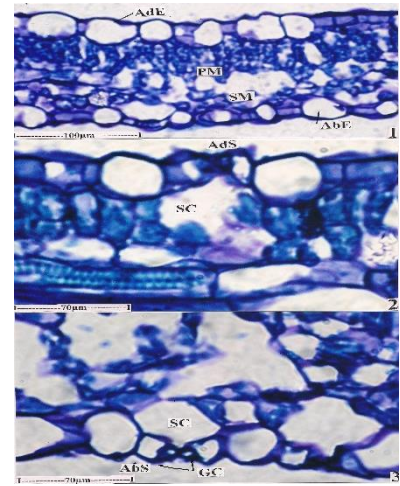


Fig 2.1: T.S of Lamina
2.2. T.S of Lamina showing adaxial stomata

2.3. Abaxial stomata (AbS – Abaxial Stomata, AbE – Abaxial Epidermis, AdE – Adaxial Epidermis, AdS – Adaxial Stomata, GC – Guard cell, PM – Palisade Mesophyll, Sc – Sclerids, SM – Spongy Mesophyll)

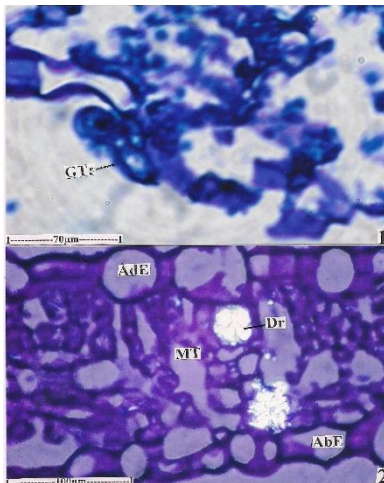


Fig.3.1: Glandular Trichome on the lamina

3.2 Crystals in the mesophyll tissue (polarized light) (AdE - Adaxial Epidermis, AbE – Abaxial Epidermis, Dr – Druces, GTr – Glandular Trichome, MT – Mesophyll Tissue)

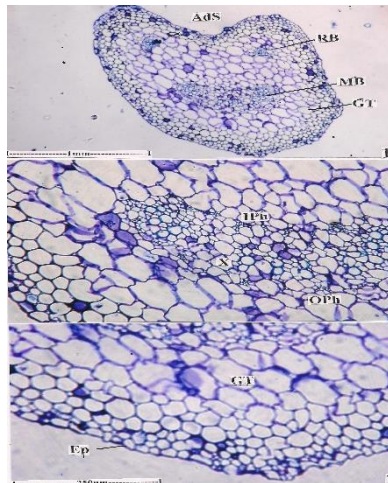


Fig. 4.1: T.S of Petiole – Entire view

4.2 T.S of Petiole – Lower portion (AdS – Adaxial side, Ep – Epidermis, GT – Ground Tissue, IPh – Inner Phloem, MB – Median Bundle, OPh – Outer Phloem, Ep – Epidermis, RB – Ridge Bundle, X- Xylem)

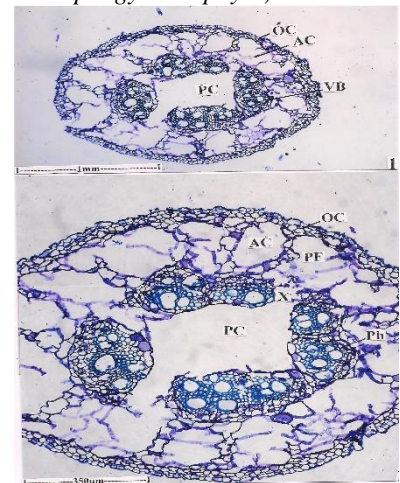


Fig. 5.1: T.S of Stem – Entire view

5. 2 T.S of Stem – Enlarged (AC – Air Chamber, OC – Outer Cortex, PC – Pith Canal, VB – Vascular bundle, PF – Partition Filament, X – Xylem)

potassium iodide (IKI) and calcium oxalate crystals of the powder was observed under the polarized microscope.^{14,15}

RESULT

Leaflet: The leaflet consists of prominent lateral veins as well as thick midrib (Fig 2.1, 2). The lateral vein and midrib have short conical adaxial part and wide, hemispherical abaxial part. The lateral vein is 300µm thick, the midrib is 600µm thick. Thick. The epidermal layer of the veins consists of fairly large, radially oblong

thickwalled cells with prominent smooth cuticle. The ground tissue is parenchymatous. It includes large thickwalled compact cells (Fig 2.2). A small cluster of collenchymatous cells is located in the adaxial conical part. The vascular strand is single, small and collateral. The vascular strand is semicircular; xylem elements are angular compact and thickwalled. Phloem occurs in small cluster beneath the xylem (Fig 2.2).

Lamina (Fig 2.1, 2.3) : The lamina is bifacial with distinction of adaxial and abaxial sides. Then lamina is

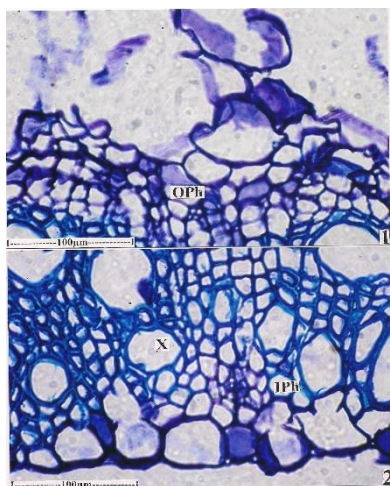


Fig 6 T.S of Stem are vascular bundle enlarged
(IPh – Inner Phloem, OPh – Outer Phloem, X- Xylem)

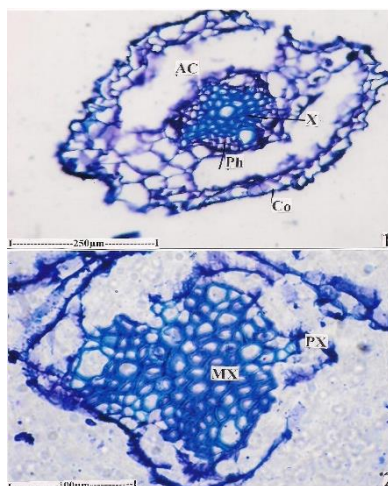


Fig 7.1 T.S of Thin Root
7.2 T.S of Thick Root
(AC- Air Chamber, CO – Cortex, M – medullary Xylem, Ph – Phloem, PX – Primary Xylem, X –Xylem)

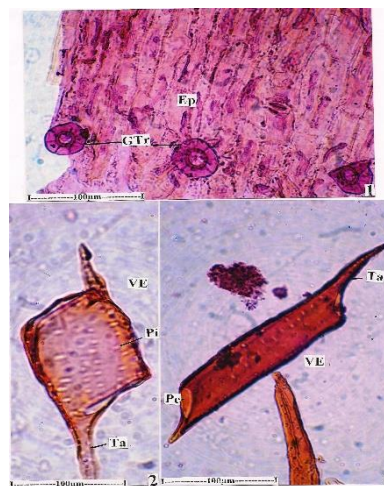


Fig 8.1 Glandular Trichomes in surface view
8.2 Short tailed vessel element
8.3 Long tailed vessel element
(Ep – Epidermis, GTr – Glandular Trichome, Pe – Perforation, Pi – Pits, Ta – Tail, VE – Vessel Element)

120µm thick. The adaxial epidermis consists of dilated drum shaped or cylindrical cells with cuticle; the cells are 25µm thick. The abaxial epidermis is slightly thin and the cells are circular to cylindrical. The palisade consists of one or two layers of cylindrical compact cells. The spongy mesophyll includes four or five layers of small spherical or lobed cells forming wide air – chambers.

Stomata: The lamina is amphistomatic. Stomata occur on both on the adaxial and abaxial sides (Fig 3.2, 3). The stomata are located on the same level of the epidermis. The guard cells have short stomatal ridges (Fig 3.3)

Glandular Trichome (Fig 4.1): Short stalked, peltate type of glandular trichomes are occasionally seen on the lamina. The gland has one celled stalk and thick, circular multicellular plate of head. The head cells are dark by stained. The head is 20µm wide and 10µm thick.

Crystals (Fig 4.2): Calcium oxalate crystals are fairly common in the mesophyll tissue. The crystals are druses or spherical spiny bodies made up of minute crystal links (Fig 10.2). They occur in normal unmodified cells. The druses are 30µm in diameter.

Petiole (Fig 5.1, 2): The Petiole is semicircular on the abaxial side and the adaxial side has wide, shallow concavity (Fig 5.1). The petiole is 1.5mm thick and 1.4mm wide. It has thin epidermal layer, outer two or three layers of collenchyma and remaining parenchymatous ground tissue. These are three vascular strands one strand being larger and centrally located; other two bundles are placed in the adaxial ridges. The vascular bundles are bicollateral; the bundle has central xylem elements on the outer and inner portions (Fig 6.2).

Stem (Fig 5.1, 2; 6): The stem is circular in sectional view measuring 1.3mm thick. It consists of less distinct epidermal layer followed by two or three layers of outer cortical zone. The inner cortex comprises wide radially stretched air chambers separated from each other by

uniseriate radial partition filaments (Fig 5.1, 2). The central part of the stem is hollow surrounded by four thick radially compressed vascular bundles. The vascular bundles are bicollateral having phloem elements both on the outer and inner portion. The outer phloem includes prominent clusters of sieve elements (Fig 6) and the inner phloem is less prominent with small nests of sieve elements (Fig 6).

Root (Fig 7.1, 2): The roots are thin and delicate. It consists of a thin epidermal layer and one or two layers of outer cortex. Inner cortex is occupied by fried air chambers. The xylem elements are heavily thick walled and lignified. They are angular and compact small masses of phloem alternating with protoxylem arms. (Fig 7.1).

Powder Microscopic observation: The Powder preparation of the plant exhibits the following elements when examined under microscope

- Epidermal peeling of the lamina showing capitate type of glandular trichomes is common in the powder, The glands are seen in surface view. They are circular and discoid in outline. A central circle represents the stalk and outer 4 Or 5 celled circle represents the body of the gland. The gland is 120 – 140µm in diameter.
- Vessel elements (Fig 8.2, 3; 8.1 – 3): The vessel elements very frequent seen in the powder. They are either short wide and drum shaped Fig (8.2) or long, narrow and cylindrical (Fig 8.3, 9.1, 2, 3). Some of the vessel elements are long tailed at both or one end (Fig 8.2, 3). They have wide circular end wall perforation. The perforation is horizontal or oblique in orientation. Pits are abundant on the lateral walls. They are circular and bordered. The vessel elements are 70 – 250µm long.
- Fibres: The fibres are more frequent than the vessels. They are long, narrow and thick walled. The walls are lignified. They are 50µm long and 10µm wide. (Fig 9.1)

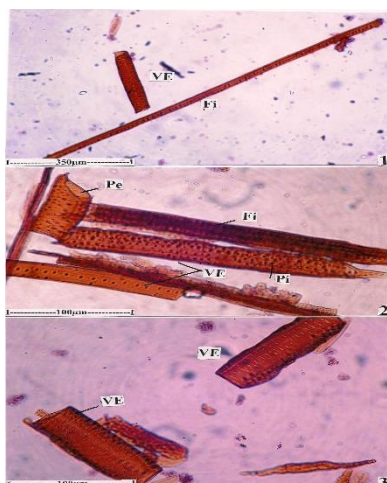


Fig 9.1: One vessel element & a fibre
9. 2. Short & long vessel elements
9. 3. Short, cylindrical vessel element
(Fi – Fibre, Pe – Perforation, Pi – Pits, VE – Vessel Element)

- Sclereids are less common. They are similar to the fibres; they are long, narrow, and cylindrical with tapering buds. But, unlike fibres the sclereids have well developed multiseriate wide simple pits (Fig 9.2)
- Parenchyma cells are seen in vertical strands. They are narrow, elongated and thin walled. The cells have amorphous inclusions (Fig10.1)

DISCUSSION

Leaflet: The leaflet consists of prominent lateral veins as well as thick midrib. The lateral vein and midrib have short conical adaxial part and wide, hemispherical abaxial part respectively. A small cluster of collenchymatous cells is located in the adaxial conical part. The vascular strand is single, small and collateral.

Lamina: The lamina is bifacial with distinction of adaxial and abaxial sides. The lamina is amphistomatic. Stomata occur on both the adaxial and abaxial sides. Short stalked, peltate type of glandular trichomes are occasionally seen on the lamina. Calcium oxalate crystals are fairly common in the mesophyll tissue.

Petiole: The Petiole is semicircular on the abaxial side and the adaxial side has wide, shallow.

Stem: The stem is circular in sectional view measuring 1.3mm thick, with cortical zone. The inner cortex comprises wide radially stretched air chambers separated from each other by uniseriate radial partition filaments. The vascular bundles are bicollateral in nature

Root: The roots are thin and delicate. It consists of a thin epidermal layer and one or two layers of outer cortex. Inner cortex is occupied by fried air chambers.

The Powder microscopic observation of the plant *Merremia emarginata* exhibits epidermal peeling of the lamina showing capitate type of glandular trichomes. Vessel elements are either short wide or drum shaped. The fibres are more frequent than the vessels, the walls are lignified. Sclereids are less common, parenchyma cells are seen in vertical strands.



Fig 10.1: Fibres and Parenchyma strand
10.2 Sclerid enlarged
(Fi – Fibre, Lu – Lumen, Pa – Parenchyma, Pi – Pits, Scl – Scleride)

The Powder microscopic observation of the plant *Merremia emarginata* exhibits epidermal peeling of the lamina showing capitate type of glandular trichomes. Vessel elements are either short wide or drum shaped. The fibres are more frequent than the vessels, the walls are lignified. Sclereids are less common, parenchyma cells are seen in vertical strands.

CONCLUSION

The above mentioned microscopic features can be considered as reliable and simple characters for botanical diagnosis of whole plant *Merremia emarginata* (WME).

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