www.sphinxsai.com

PharmTech

International Journal of PharmTech Research
CODEN (USA): IJPRIF ISSN : 0974-4304
Vol.2, No.3, pp 2001-2006, July-Sept 2010

Pharmacognostic Parameters for the Evaluation of the Leaves and Young Stem of *Memecylon umbellatum* Burm.f.

Padmavathy J[1*],Raju D[2], Sai Saraswathi V[3], Kayalvizhi M, Saravanan D[1]

[1*]Ratnam Institute of Pharmacy, Pidathapolur, Nellore-524 346, Andhra Pradesh, India.

[2]Department of Pharmacology, SRM College of Pharmacy, Kattankulathur, Chennai, Tamil Nadu, India

[3]Pharmaceutical Chemistry Division, VIT University, Vellore, Tamil Nadu, India.

*Corres.author: padmaviji82@gmail.com
Phone: +91 9160050173*

Abstract: In Ethnomedicinal practices, the traditional healers use the leaves and young stem of *Memecylon umbellatum* Burm.f. in the treatment of leucorrhoea and gonorrhoea. The investigation was carried out to study the pharmacognostical characteristics of the plant material. The various parameters like macro-morphology, micro-morphology, quantitative microscopy, physicochemical profile and the salient diagnostic features are documented. The characteristic powder analysis and fluorescence analysis was also carried out.
Keywords: *Memecylon umbellatum* Burm.f., pharmacognostical, microscopy, fluorescence analysis.

Introduction

Memecylon umbellatum Burm.f., belonging to the family Melastomataceae is a small tree of 2.5 – 5m.[1,2,3,4] The species is found distributed throughout the Eastern Peninsular India of the Andamans and mostly on the Coastal islands in Evergreen and Semi-Evergreen areas, Orissa, Assam, Sylhet Southern Mountains of Malay Peninsula.[5,6] The leaves and root of *M.umbellatum* is used externally as a cooling astringent and in conjunctivitis, internally it is used for the treatment of leucorrhoea and gonorrhoea. The flowers of the tree are used for the treatment of various skin troubles. The bark of the tree is used in various indigenous systems of medicine for treating different ailments.

According to an Ethnomedicinal survey, the tree *M.umbellatum* Burm.f. has wide pharmacological properties,[7,8] but it exists little phytochemical and pharmacognostical characteristics. The allied species of the same genus *M.malabarium* showed anti-bacterial, anthelmintic, anti-inflammatory and antimicrobial activity.[9]

Though the plant has been reported for many biological activities, it has very little report against antibacterial activity. However the recent study showed the presence of antibacterial activity against few organisms and the effect was comparable with the standard drug, Ciprofloxacin.

In addition, an attempt was also made to explore the anti-fungal properties of the plant. In the present work, various pharmacognostical parameters have been investigated which could serve as a measure of authentication and serve as a tool for the identification of the plant.

Materials and Method

Plant Material

The whole plant material of *M.umbellatum* Burm.f. was collected in the month of December from Scrub jungle of Orakkadam, 20 km from Chennai, Tamil Nadu, India.

Microscopy

The plant material was fixed in a mixture of solvents containing formalin, acetic acid and alcohol (70% v/v) for histological studies. After 24 hours of fixing, the specimens were dehydrated with graded series of tertiary butyl alcohol as per the schedule given by Sass 1940. Infiltration of the specimens was carried by gradual addition of paraffin wax until tertiary butyl alcohol solution attained super saturation. The specimens were cast into paraffin blocks. Transverse sections (T.S.) of the different organs of the plant materials was taken using a rotary microtome and stained with different stains. Microphotographs of the sections were made by using nikhon labhot 2 microscopic unit.

Quantitative Microscopy

Quantitative microscopy such as stomatal number, stomatal index, vein islet number and vein termination number were performed as per standard procedures (Table 1).[10,11]

Physicochemical Constants

Physicochemical analysis was carried out and the physicochemical constants such as the percentage of total ash, acid insoluble ash, water soluble ash, sulphated ash, water and alcohol soluble extractives were calculated (Table 2).[12]

Powder Microscopy and Fluorescence Analysis

The leaf and stem powder of *M.umbellatum* Burm.f. was analysed under the dark field and bright field microscope for powder characteristics.

Fluorescence analysis of the leaves and young stem powder of *M.umbellatum* Burm.f. was observed in daylight and UV light (long and short).[13,14]

Results

Taxonomic Description of the Plant

M.umbellatum is a small tree of 2.5 – 5m height. Leaves are ovate-oblong or lanceolate-eliptic, 2.5 – 5 x 1.5 – 3 cm long, coriaceous, glabrous, cuneate or obtuse, base margin entire and apex obtuse – retuse. Umbels are compact, peduncle almost reduced with no bracteoles (Fig 1). Flowers are sub sessile and 4 mm across, calyx tube is 1 mm long. The four lobes are ovate – suborbicular. The four orbicular blue petals is 1 mm in length. Stamens are 8 in number and 2 mm long. Filament is about 3.5 – 4.5 mm in length. It has globose ovary 1.5 mm length. It is 1 celled, Style is about 1 cm long. Seeds are yellow, obovoid and 4.5 mm long. It bears globose berry 6 x 4.5 mm. The fruits are yellow in colour when ripen.

Microscopic Characters of the Leaves

Transverse section of the leaf shows the dorsiventral nature of the leaf. The important tissues in the lamina and the midrib regions were (Fig 2).

Lamina: The epidermal cells were vertically rectangular. The adaxial epidermis was unistratose, thick and thickly cuticularised. The abaxial epidermis was also unistratose, thinner than adaxial epidermis. The cells were squarish, cuticle was thick and wavy. The mesophyll was differentiated in to adaxial zone of palisade cells and abaxial zone of spongy mesophyll. The palisade cells were in 2 or 3 rows, narrowly cylindrical. The spongy mesophyll cells were small and lobed forming aerenchymatous tissue. The most distinguishing feature of the lamina was the occurrence of foliar sclereids in the mesophyll tissue. The sclereids were long, thin filiform, branched cells with thick walls. They ramified throughout the lamina forming sub epidermal layer and penetrating into the mesophyll both vertically and horizontally.

Midrib: The midrib was slightly thicker than the lamina. It consisted of a large, broadly arc shaped abaxial main vascular strand and two small accessory adaxial vascular strands. The main vascular strand has broad zone of radically aligned xylem elements and broad zones of adaxial phloem and abaxial phloem. Therefore the main vascular strand was bicollateral. The accessory adaxial strands were collateral with phloem on the upper side only. On the lower part of the midrib was a pad of compact parenchymatous ground tissue and on the upper part was also a small mass of parenchymatous cells bridging the vascular strand and the adaxial epidermis.

Microscopic Characters of the Young Stem

The T.S. of the young stem was circular in outline with uneven surface and showed the following regions (Fig 3)

Epidermis: The epidermal cells were radially oblong with the outer anticlinal walls projecting as papillate hemispherical bodies.

Cortex: It consisted of 4 – 5 layers of tangentially oblong thick walled cells. Inner cortex was a thin, continuous cylinder of sclerenchyma elements – sclereids with thick lignified walls.

Vascular bundle: It consisted of secondary xylem and secondary phloem. The peripheral zone of secondary xylem was uneven with furrows and ridges. Secondary xylem consisted of fibres with thick lignified walls and narrow thick walled vessels which were either solitary or in short radial multiples. There are 2 types of phloem – one occurred outer to the secondary xylem cylinder which was normal type of phloem – inter-xylary phloem. The second type of phloem occurred

inner to the xylem and on the periphery of the pith called as medullary phloem or intra-xylary phloem. The phloem comprised of sieve tubes, companion cells and parenchyma cells. The pith consisted of mass of sclereids which were circular, wide-lumened and lignified. Some sclereids had dark amorphous inclusions.

Powder Study of the Leaves

The various diagnostic characters of the leaf powder are depicted in the Fig 4.

Starch grains: Under polarized light microscope, unstained starch grains appeared as white bodies against dark back ground. Under darkfield microscope, they were brownish yellow glowing against dark background. Under bright field microscope, stained with iodine-potassium iodide, they appeared as dark violet bodies. They were circular, ovoid or elliptical, crystalline in nature and showed specific patterns of black lines.

Calcium Oxalate crystals: Few calcium oxalate crystals were seen in leaf powder as shown in Fig. 5.

Powder Study of the Stem

The various diagnostic characters of the stem powder are depicted in Fig 6.

Coarse powder of the stem showed different types of vascular elements, sclereids and parenchyma cells. Xylem elements consisted of vessel elements, libriform fibres and xylem parenchyma. Xylem vessels were long, narrow and cylindrical with simple perforation plate, long narrow tails with bordered lateral wall pits. Some xylem fibres had no lateral wall pits and some others have a vertical row of well developed pits. Xylem parenchyma was rectangular and thin walled.

Fluorescence Analysis of Leaf and Young Stem Powder

The fluorescence analysis of the leaf and the young stem of *M.umbellatum* Burm.f. showed the presence of fluorescence compounds in both the powders (Table 3)

Table 1: Quantitative Microscopy of the leaves of *M.umbellatum* Burm.f.

Description	Measurements
Stomatal Number	28.5 / Sq.mm
Stomatal Index Number	10.87 / Sq.mm
Vein Islet Number	17.1 / Sq.mm
Vein Termination Number	26 / Sq.mm

Table 2: Physicochemical Constants and Extractive Values of the Leaves and Stem Powder of *M. umbellatum* Burm.f.

Parts Used	Parameter	%w/w
Leaves	Total Ash	7.48
	Water Soluble Ash	1.24
	Sulphated Ash	59
	Acid Insoluble Ash	0.534
	Water Soluble Extractive	1.16
	Alcohol Soluble Extractive	0.84
Stem	Total Ash	2.93
	Water Soluble Ash	1.49
	Sulphated Ash	11
	Acid Insoluble Ash	0.533
	Water Soluble Extractive	0.32
	Alcohol Soluble Extractive	0.28

Table 3 : Fluorescence analysis of leaf and young stem powder of *M.umbellatum* Burm.f.

Parts Used	Treatment	Day Light	Short UV Light (254 nm)	Long UV light (365 nm)
Leaves	Powder as such	Light green	Yellowish green	Green
	Powder + 1N NaOH(Aqueous)	Brown	Black	Blackish green
	Powder + 1N NaOH (Alcoholic)	Chocolate brown	Light green	Lower – brown Upper – green
	Powder + 1N HCl	Pale brown	Black	Dark green
	Powder + 50% H_2SO_4	Yellowish green	Black	Dark green
Stem	Powder as such	Creamish yellow	Pale yellow	Pale green
	Powder + 1N NaOH(Aqueous)	Dark brown	Dark green	Light green
	Powder + 1N NaOH (Alcoholic)	Light Chocolate brown	Light green	Bluish green
	Powder + 1N HCl	Light brown	Green	Pale green
	Powder + 50% H_2SO_4	Dark brown	Blackish brown	Blackish green

Fig 1: *Memecylon umbellatum* Burm.f.

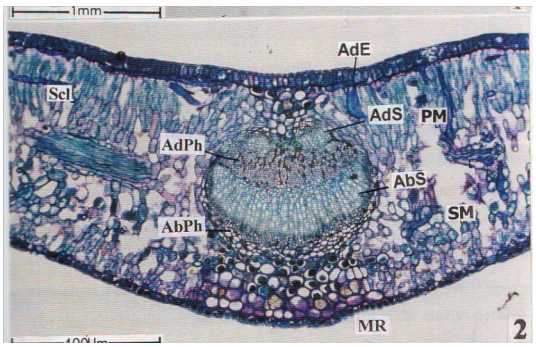

Fig 2: Transverse section of the leaf Showing dorsiventral nature

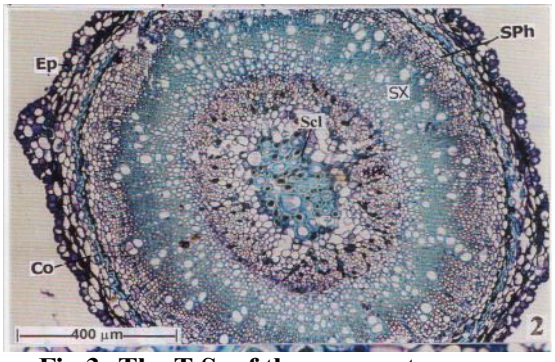

Fig 3: The T.S. of the young stem

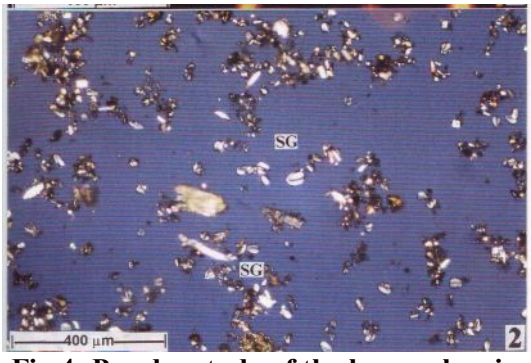

Fig 4: Powder study of the leaves showing Starch grains

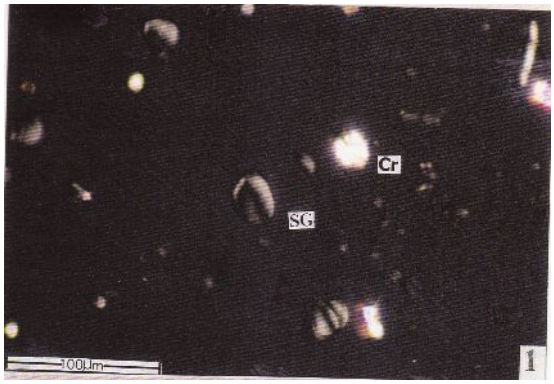

Fig 5: Powder study of the leaves showing Calcium oxalate crystals

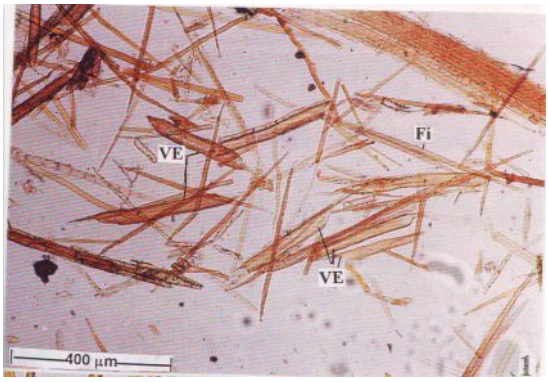

Fig 6: Powder study of the stem

Discussion

Plants serve as vast source for varied phytoconstituents exhibiting varied pharmacological property. Identifying such potential plants is of significance in medicine. So it becomes necessary to study the pharmacognostic characteristic of the plant before its use in the field of research and also in pharmaceutical formulation. Moreover it also helps in distinction from other allied species and adulterants. In this connection, in the present study the Pharmacognostical characteristics of the stem and leaf of the plant *M.umbellatum* Burm.f. was examined. The macromorphological features and the microscopic features of the plant investigated by pharmacognosist may serve in assigning botanical standards.

Microscopic evaluation is an indispensable tool for identification of medicinal herbs and is one of the essential parameter in modern monograph. In this regard the important microscopic features of the leaves and young stem of the plant have been documented such as T.S. of leaves showing the presence of rectangular, thickly cuticularised, unistratose adaxial epidermis, thin cuticularised unistratose abaxial epidermis, adaxial zone of palisade cells, abaxial zone of spongy mesophyll and foliar sclereids, abaxial main vascular strands and two small accessory adaxial vascular strand. T.S. of stem showing the presence of radially oblong epidermal cells, tangentially oblong thick walled cortex cells, thick lignified sclereids, secondary xylem, intra-xylary phloem and inter-xylary phloem. The leaf and stem powder characters study showed the presence of circular elliptic and ovoid types of starch grains, large sphaerocrystals of calcium oxalate crystals, vascular elements, sclereids and parenchyma cells.

Fluorescence analysis of the leaf and young stem powder of *M.umbellatum* Burm.f. showed the presence of fluorescence compound which would serve as valuable information for the scientist engaged in research on the medicinal properties of this plant. Studies on physicochemical constants can serve as a vital source of information and provide suitable standards to determine the quality of this plant material in future investigations.

References

1. Asima Chatterjee and Satyesh Chandra Prakash, The treatise on Indian Medicinal Plants, National institute of Service Communication, New Delhi, 1994, 2, 184.
2. Wealth of India, National Institute of Science Communication & Information resources, CSIR, Delhi, 1948, Vol X, 258.
3. Chopra R. N., Nayar S. L., and Chopra I. C., Glossary of Indian Medicinal Plants, Council of Industrial & Scientific Research, New Delhi, 1986, 165.
4. Kirtikar K. R., and Basu B. D., Indian Medicinal Plants, Periodical Experts, New Delhi, 1975, Vol 2, 1065-1066.
5. Yoganarasimhan S. N., Medicinal Plants of India, Interline Publishing Pvt. Ltd, Bangalore, 1998, 2, 247-260.
6. Parthasarathy N., and Sethi P., Trees and liana species diversity and population structure in a tropical dry evergreen forest in South India, Tropical Ecology, 1997, 38, 1, 19-30.
7. Amalraj T., and Ignacimuthu S., Evaluation of the hypoglycaemic effect of *Memecylon umbellatum* in normal and alloxan diabetic mice, Journal of Ethnopharmacology, 1998, 62, 3, 247-250.
8. Perumal Samy R., Ignacimuthu S., and Sen A., Screening of 34 Indian Medicinal Plants for Antibacterial Properties, Journal of Ethnopharmacology, 1998, 62, 2, 173-181.

9. Kiran Kumar Hullatti and Ravishankar Rai V., Antimicrobial activity of *Memecylon malabaricum* leaves, Fitoterapia, 2004, 75, 3-4, 409-411.
10. Lala P. K., Practical Pharmacognosy, Lina Guha, Calcutta, 1981, 86-89.
11. Kokate C. K., Practical Pharmacognosy, Vallabh Prakashan, Delhi, 1994, 117-120.
12. Anonymous, Indian Pharmacopoeia, Govt. of India, New Delhi, 1996, Vol I, A 3.38.
13. Indian Pharmacopoeia, Controller of Publications, Govt. of India, Ministry of health & family welfare, Delhi, 1996, Vol II, A-74.
14. Beckett A. H., and Stenlake, Practical Pharmaceutical Chemistry, CBS Publishers & distributors, New Delhi, 1997, First Edition, 358-370.

*****