Innovare Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 7, Issue 7, 2015

Original Article

# MICROMETRIC EVALUATION OF *MELASTOMA MALABATHRICUM* L. FLOWER

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***Received: 30 Apr 2015 Revised and Accepted: 30 May 2015***

**ABSTRACT**

**Objective:** To assess the effectiveness of micrometric evaluation in the standardization process of raw drugs. In this work, emphasis has been mainly put on micrometric evaluation of different parts of *M. malabathricum* L. flower.

**Methods:** Transverse section of various parts of the flower was taken and dry flower was also made into powder, then micrometric measurement of individual characters or a group of tissues was evaluated.

**Results:** Experimental study revealed that the transverse section of the filament is circular in shape. Measurement of the outermost layer or the epidermis of the filament is 0.49–0.64 mm in diameter. Transverse section of the style is circular in shape and consists of 3 concentric spherical rings and measurement of an outer ring is 0.65 mm in diameter.

**Conclusion:** With the data generated in this research work it can be concluded that micrometric evaluation of the subjected drugs is an effective tool for the standardisation process with special reference to specific parts (in this case, flower) of raw drugs.

**Keywords:** *Melastoma malabathricum* L., Micrometric evaluation, Filament, Shrub.

## INTRODUCTION

The plant of this research work has been reported to have some folklore claims; because of that it has got the attention from various scholars to explore those claims on different aspects. *Melastoma malabathricum* L. belongs to family Melastomaceae is a shrub and occurs in many places of India such as Manipur, Mizoram, Wokha, Karnataka etc. and known by many local names. In Karnataka it is locally known as *Nekkarika*, in English it is called as Indian Rhododendron. It is a beautiful bushy shrub, grows up to height of 1-2.5 m. branches are 4 angled & twigs are densely covered with paleaceous hair (scale). Leaves are broadly lanceolate in shape & most of the times are5 nerved at the base. The venation of leaf is multi-costate convergent type. The surface of the leaf is covered with stout scabrid hair on both sides. Petiole is also covered with flat hairs. Corolla is bright mauve purple in colour. Fruits are broadly ovoid in shape & 1.2 cm in length. In mature state hypanthium becomes brittle & breaks transversely. Seeds are numerous and minute. Flowering mainly occurs during the time of February to May & fruiting takes place during the November to December. The plant is distributed throughout the India, in valleys near the streams up to an elevation of 1800 m [1]. Although there are some Pharma cognostical studies carried out by previous scholars regarding different parts of the same plant. But those studies were mainly focused on morphological & microscopical aspects of the plant in general terms. So this current study of micrometric evaluation is very much encouraging & rationale in its own term.

Floral formulae: $\mathrm{Br}, \oplus, \mathrm{♂♀}, \mathrm{K}_{(5)}, \mathrm{C}_{5}, \mathrm{A}_{5+5}, \mathrm{G}_{(5)}$

## MATERIALS AND METHODS

### Plant collection and authentication

Samples were (*Melastoma malabathricum* L.) collected from Moodabidri (DK) which is the natural habitat of the plant. The place belongs to the Covering Western Ghats of Karnataka, latitude 13.08° N, longitude 74.98° E, elevation 147m (482ft.) from sea level. Soil type was Red laterite with gravel.

Plant was authenticated by the chief pharmacognosist, I. P. G. T. & R. A. of Gujarat Ayurved University. The plant was registered in Authentication Panel Book & a specific authentication number was generated. Plant Authentication Number: Phm. 62127.

### Morphological study

Under the Morphological study, the basic structure; the types of formation of a particular organ & their arrangement in different parts of *Melastoma malabathricum* L. flower was studied in detail. These observations were noted properly and then matched with the data available in taxonomic book & with the flora [2, 3].

### Macroscopic study

The samples were cleaned properly and macroscopic study of the different flower parts was carried out. The individual character of the flower like pedicel, calyx, corolla, androecium & gynoecium was separated then individual macroscopic characters like size, shape, and colour were noted in detail [4-6].

### Microscopic study

Free hand transverse sections of different flower parts were taken and then cleared with chloral hydrate solution. Sections were first mounted in distilled water then stained with phloroglucinol and conc. HCl. Microphotographs were taken by Carl-zeiss-trinocular microscope [7].

### Micrometric study

Under the micrometric study, the measurement of a particular character or a particular band/zone which was made up of similar kind of tissues/cells was taken into consideration, which was otherwise not possible to make them accountable aided with our naked eyes. These characters are microscopic in nature & when they are labelled with their measurement, those characters can be very effective tools to standardize a particular drug due to their specificity & preciseness.

### Organoleptic evaluation

Organoleptic characters like color, odor, taste and touch were evaluated as per standard procedure [6].

### Powder microscopy

For microscopic evaluation of the powder, first small quantity of powder was mounted with distilled water to observe the crystals and other microscopic characters then stained with iodine solution for starch grains. Another set of slides was prepared & stained with

phloroglucinol & concentrated HCl for lignified tissues. Microphotographs were taken by Carl zeiss trinocular microscope [5].

## RESULTS

### Morphological study

Flowers are bright mauve-purple in color & arranged in cluster at the ends of twigs. Pedicel is distinct, cylindrical & covered with flat pale aceous hair. Calyx is cup shaped at the base but it becomes free (5 sepal) at the top. Calyx is also covered with flat hairs. Flowers are penta-merous. Individual petal is narrow at the base & ovoidal at the top. Stamens are twice as many as sepals. Stamens are grouped in two categories (dimorphous). In one group anthers & connectives are purple in color & in another group they are yellow in color. In both of the cases, filaments are yellow in color. Connectives are basifixed to the anther lobes. Gynoecium is perigynous. Style is cylindrical & pinkish in color. Top/cap of the style is crested in type. Morphology of the plant has been shown in fig. 1(a, b).

a b

**Fig. 1a: Flowering twig. b: Terminal and axial branches with fruit in cluster**

The type of in florescence in *Melastoma malabathricum* L. flower is terminal & axillary cymose cluster.

### Macroscopic study

Under the macroscopic study shape, size & color of the different parts of the flower was measured & noted appropriately. Then the observations were documented in table no. 1. Macroscopic study has been demonstrated in the fig. 2(a–d).

### Microscopic study

Different parts of the flower like pedicel, calyx, petal, androecium & gynoecium were separated then transverse section of each individual part was studied thoroughly. The results obtained from transverse sections of various parts of the flower were described below.

### Pedicel

Epidermis was defined by 1-3 layers of cell with brown content. The outer surface of the epidermis was surrounded by segmented extensions at the interval of 0.2 mm approximately, fig. 3 (a). These extensions were formed with layers of elongated, lignified collenchymatous cells. The gaps between the two extensions were filled with lignified, multi branched, multi serrate trichome (0.24 mm×0.35 mm). Cortex region was formed with 10–12 layers of parenchymatous cell which was often filled with brown content and rosette crystals. At the mid-point of the cortex region a band of vascular bundle was present in a ring form. Endodermis was prominent & formed of two layers of oval shaped parenchymatous cell. The pericyclic region & the phloem region was not distinctively differentiated as such. But a thick band formed of these two kinds of tissue was found to be prominent & cells were often filled with rosette crystals. This mixed band of tissues was infiltrated by radially growing multi-serrate medullary rays & xylem tissues. Meta-xylem was situated towards the circumference & proto-xylem was directed towards the pith region. Pith region was distinctive & sometimes filled with rosette crystals & brown content.

a b c d

**Fig. 2: a: Whole flwoer. b: Dissected parts of the flower, sepals & calyx cup. c: Ovary, stigma & style along with androecium. d: Stamens are grouped into two categories (dimorphous), in one group stamens are larger(5 in number) & in another group stamens(5 in number) are shorter**

**Table 1: Macroscopic measurement of flower parts**

| Character | No. of character in a single flower | Measurement | Colour |
|---|---|---|---|
| Pedicel | 1 | 0.5 cm × 0.2 cm | Brownish |
| Calyx cup | 1 | 0.6 cm in diameter | Brownish |
| Sepal | 5 | 0.8 cm × 0.2 cm | Greenish |
| Petal | 5 | 1.7 cm × 1.5 cm | Purple |
| Long filament | 5 | 1 cm × 0.1 cm | Yellow |
| Short filament | 5 | 0.6 cm × 0.1 cm | Yellow |
| Long anther | 5 | 0.7 cm × 0.1 cm | Reddish |
| Short anther | 5 | 0.5 cm × 0.1 cm | Yellow |
| Ovary | 5 | 0.5 cm × 0.6 cm | Reddish |
| Style | 1 | 0.8 cm × 0.1 cm | Reddish |
| Stigma | 1 | 0.05 cm in diameter | blackish |

**Calyx**

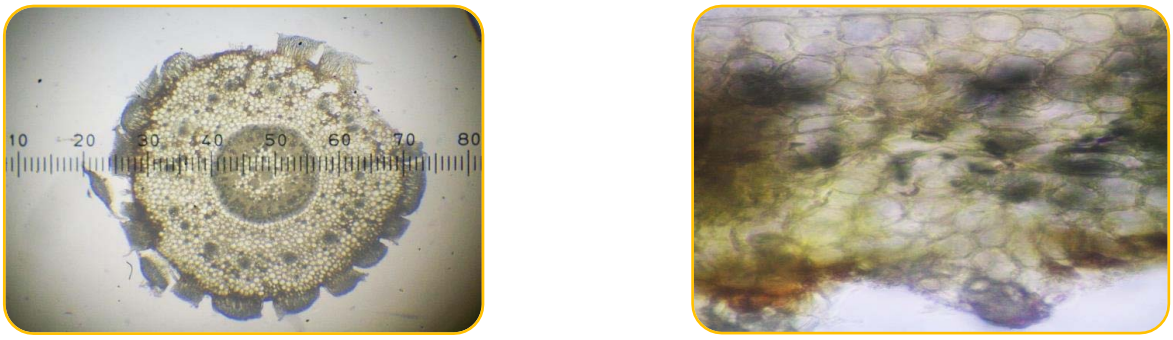
Inner surface of the calyx which was adjacent to corolla formed of radially elongated epidermal cells (pinkish). The epidermal layer formed an outline & covered the layers (5-7) of more or less loosely bound parenchymatous cells, fig. 3 (b). Vascular bundles in the separated group were instilled in these layers. These parenchymatous layers also contained rosette crystals, oil globule & brown content. The parenchymatous layers were externally defined by 1-2 layers of barrel shaped epidermal cells. The outer epidermis was covered by segmented extensions which were formed of lignified colleenchymatous tissues. The gaps between the segmented extensions sometimes consisted of lignified multi serrate trichome.

**Petal**

Transverse section of individual petal through its mid-point showed two distinctive outlines, one defining the inner most layer & another defining the outer most layer of petal. The inner epidermis was light pink whereas outer epidermis was dark pinkish in color. Both the epidermis was formed of the single layer. In between two layers of epidermis 5-6 layers of loosely bound parenchymatous cells were found, fig. 4(a). Vascular bundles were instilled as separated group form in these layers.

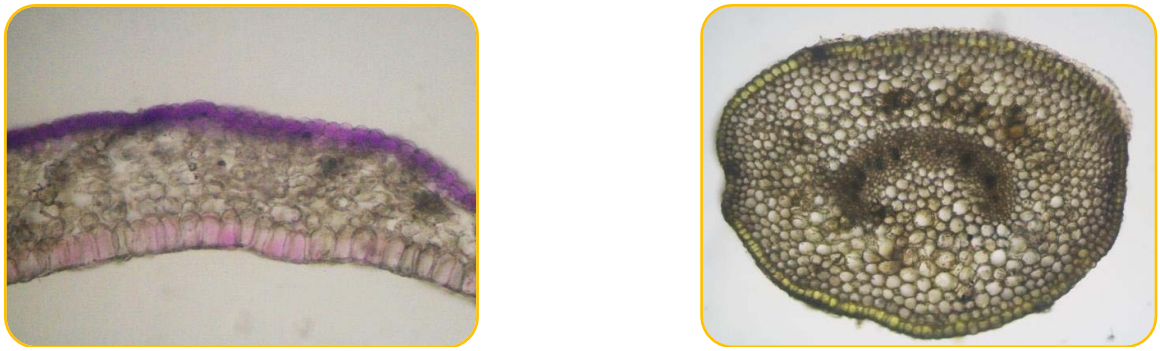
**Androecium**

Transverse section through individual filament depicted that epidermal layer was confined by a single layer of ovoidal cells. All the epidermal cells were light green in color. This particular color may be due to presence specific kind of oil. Below the epidermis 7-8 layers of parenchymatous cells were found to be arranged in a compact form fig. 4(b). These cells were mostly ovoidal in shape & sometimes few of them contained with light brown content. At the end of parenchymatous layers, a distinctive band of vascular bundles were present. This band of vascular system was arranged in a semi lunar form. Transverse section through the individual anther revealed that it is made up of two distinctive lobes & each lobe consisted of several numbers of pollen grains.



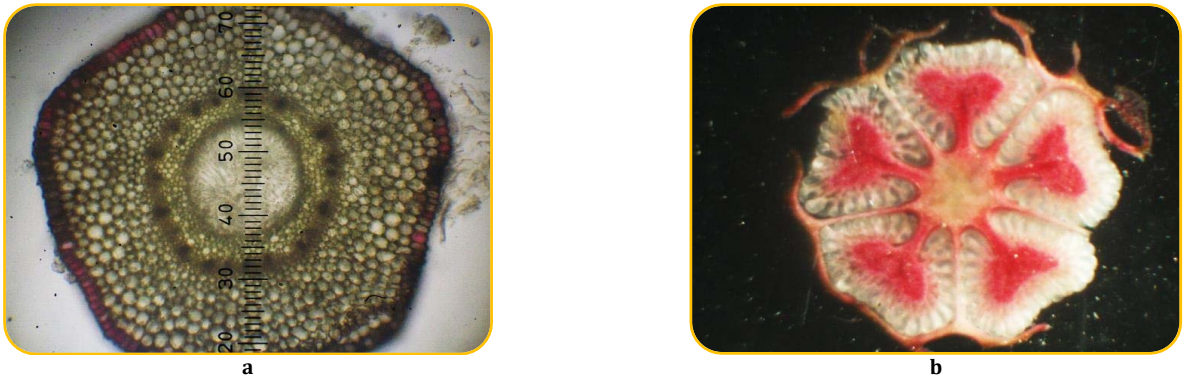

a b

**Fig. 3: a: Transverse section of pedicel with measurement. b: Transverse section of calyx showing different layers**



a b

**Fig. 4: a: Transverse section of petal showing epidermis & 5-6 layers of parenchymatous cells. b: Transverse section of filament showing epidermis & 7-8 layers of parenchymatous cells along with band of vascular bundles**




a b

**Fig. 5: a: Transverse section of style showed single layered of epidermis, 7-8 layers of parenchymatous cell & circular band of vascular bundles. b: Transverse section of ovary revealed that it consisted of 5 locules**

**Gynoecium**

Transverse section through individual style showed that epidermal layer was made up of a single layer of longitudinally elongated cells. These epidermal cells were filled with pinkish pigmentation. Bellow the epidermis, compactly arranged layers (7-8 layers) of parenchymatous cells were found fig. 5(a). At the end of these layers, a band of parenchymatous tissues (6-8 layers) was found & vascular bundles were embedded to this layers in the separated group, forming a ring like the vascular system. Bellow the vascular system there was another spherical zone forming the pith like structure at the center of section.

Transverse section through an ovary revealed that it was penta-locular fig 5(b). Each of the locules contained more than 25 ovules. In mature form ovules were found to be hook shaped.

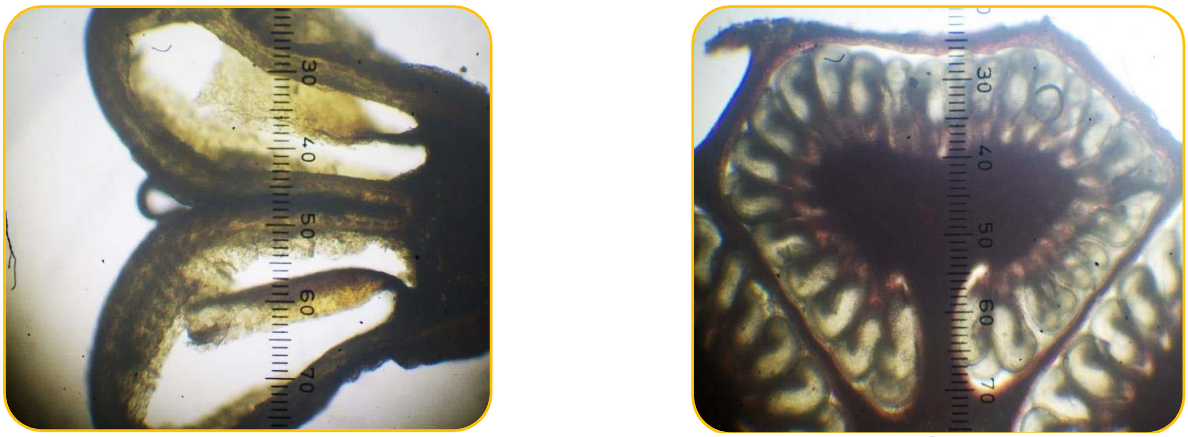
**Micrometric study**

The results obtained from micrometric study have been given in table no. 2; fig. 6(a, b).

**Table 2: Micrometric measurement of different parts of the flower**

| Characters | Features of an individual character | Measurements | Magnification |
|---|---|---|---|
| Androecium | Anther consists of two lobes. Measurement (t. s.) of a single lobe– | 0.75 mm × 0.51 mm | 10 × 10 |
| | Thickness of the anther lobe– | 0.05 mm | 10 × 10 |
| | Lumens of anther lobe (2). Measurement of a single lumen– | 0.6 × 0.18 mm | 10 × 10 |
| | Pollen grain (innumerable). Measurement of a single pollen grain | 0.016 mm (average) | 10 × 40 |
| | T. s. of the filament is circular in shape. Measurement of outer epidermis– | 0.49–0.64 mm[dia.] | 10 × 10 |
| Gynoecium | Gynoecium is penta-locular. Each locule is diamond shaped. Measurement of a single locule– | 1.25 mm × 1.82 mm | 10 × 4 |
| | T. s. of the style is circular in shape and consists of 3 concentric spherical rings. Measurement of outer spherical ring/outer epidermis– | 0.65 mm in diameter | 10 × 4 |
| | Measurement of middle ring/band of vascular bundle– | 0.30 mm in diameter | 10 × 4 |
| | Measurement of inner ring– | 0.26 mm in diameter | 10 × 4 |
| | Top of Stigma is convex in shape. Base of the cap was measured. | 0.35 mm in diameter | 10 × 4 |

t. s. = transverse section, dia. = diameter.



a b

**Fig. 6: a: Two lobes of anther were depicted in the figure. b: Diamond shaped locule containing many ovules**

**Table 3: Organoleptic evaluation of the study drug**

| Attributes | Observation |
|---|---|
| Color | Dull brown. |
| Odour | Characteristic. |
| Taste | Initially slightly bitter, ends with astringent taste. |
| Touch | Coarse. |

**Table 4: Powder microscopy of the study drug**

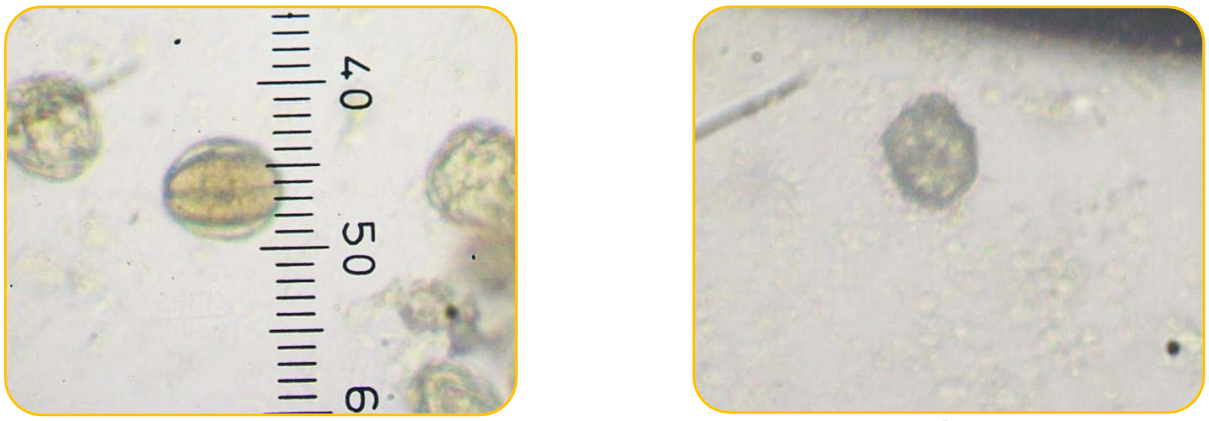
| Characters | Measurements | Colour |
|---|---|---|
| Rosette crystal | 0.018 mm | Characteristic |
| Pollen grain | 0.016 mm | Yellow |
| Multi-serrate trichome | … | Pink |
| Parenchymatous cell with brown content | … | Brown |
| Starch grain | 0.012 mm | Violet |
| Annular vessels | 0.20 mm thick | Light pink |
| Oil globule | … | Yellowish |

**Organoleptic evaluation**

All the results obtained from organoleptic evaluation have been given in the table 3.

**Powder microscopy**

All the results obtained from powder microscopy have been given in the table 4; fig. 7 (a, b).




a b

**Fig: 7: a: Pollen grain with measurement. b: Rosette crystal from calyx**

## DISCUSSION

*Melastoma malabathricum* L. has been studied for its anti-microbial, analgesic, antipyretic, wound-healing, anti-diarrhoeal & anti-cancer activity by various scholars. The interest of researchers from various disciplinary has been mainly put on this particular plant because of its folklore claims by the traditional people. This plant also possesses high prospectus of becoming a good raw drug providing species as it occurs abundantly in many places of India & in other countries. On this aspect, it is very much prerequisite to authenticate & standardise the source plant in order to have prescribed activity. In this research work the flower of the source plant has been selected for its micrometric evaluation. These studies are simple & easy to carry out in the laboratory, still precise enough to give the inference in the more comprehensive manner. This study can also be regarded as an approach to put more emphasis on the micrometric evaluation to facilitate the standardisation procedures. The flower of *Melastoma malabathricum* L. has some morphological similarities with *Osbeckia* (petals with the same colour) as both of them are from the same family i.e. Melastomaceae. Although these two genus can be distinguished by a skilled person with very minute observation over their characteristic flower, having all similar stamens (*Osbeckia*) or having dimorphous stamens (*Melastoma*). But it is difficult to distinguish them with their simple morphological characters when they are in raw form or powder form & subjected to be used as medicine. In this regard, the micrometric evaluation of the concerned drug can facilitate the standardisation process. All the data depicted in this research work are either categorised or tabulated in a precise manner to give a proper approach for the micrometric evaluation of M. *malabathricum* L. flower.

## CONCLUSION

With these results (table no. 1, 2 & 4) it can be concluded that micrometric evaluation of the subjected drugs is an effective tool in standardization of raw drugs with special reference to specific parts (flower) of raw drugs or powder drugs. In order to utilize the micrometric method as an effective tool for the raw-drug standardisation, we need to validate this method in respect of specific nature of the raw-drug to determine how precise the method actually is.

## ACKNOWLEDGEMENT

We thank Miss Switu Jani for her sincere help to complete the whole study.

## CONFLICT OF INTERESTS

The authors have no conflicts of interest.

## REFERENCES

1. Saxena HO, Brahmam M. The flora of orissa. Vol. II. Bhubaneswar: Orissa Forest Development Corporation Ltd; 1995. p. 691-3.
2. Sharma OP. Plant Taxonomy. 2nded. New Delhi: Tata McGraw Hill Education Private Limited; 2009. p. 192-200.
3. Gamble JS. Flora of the presidency of madras. Vol. I. Dehra Dun: Bishen Singh Mahendra Pal Singh; 2011. p. 495.
4. Anonymous. Ayurvedic Pharmacopoeia of India. Part I. Vol. III. 1sted. New Delhi: Ministry of Health and Family Welfare, Department of Indian Systems of Medicine & Homoeopathy; 2001. p. 227.
5. Khandelwal KR. Practical Pharmacognosy. Pune: NiraliPrakashan; 2008. p. 161.
6. Edmund N Gathercoal, Elmer H Wirth. Pharmacognosy. 2nd ed. Philadelphia: Lea &Febiger; 1949. p. 34.
7. Evans WC. Treaseand Evans Pharmacognosy. 16th ed. London: Elsevier; 2009. p. 563.