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A REVIEW ON *MELASTOMA MALABATHRICUM* TO ENLIST ITS MORPHOLOGICAL, PHARMACOLOGICAL AND PHYTOCHEMICAL PROPERTIES

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ABSTRACT

Melastoma malabathricum is a tiny plant that is widely utilized around the world, primarily in southeast Asian nations like India because of its powerful therapeutic effects. Traditionally, the plant is used to cure wounds, inflammation, infection, diarrhoea, diabetes-related scarring, high blood pressure, piles, and other conditions in the folklore medical systems of many different nations. The plant contains essential oil, tannins, phenolic compounds, flavonoids. Numerous research on this plant indicates that practically every portion of the plant exhibits a unique medicinal property. Numerous biological effects, including antioxidant, antimicrobial, anti-inflammation, antidiarrheal, and antipyretic activity, are demonstrated by the crude extracts of the plant's various components in *in-vivo* and *in-vitro* experiments. Therefore, the purpose of this review is to provide detailed information on the pharmacological properties, phytochemical components, and ethnomedicinal applications of *M. malabathricum*.

KEYWORDS: *Melastoma malabathricum*, phytochemical analysis, folklore medicine, biological effects, *in-vivo*, *in-vitro*.

INTRODUCTION

For thousands of years, plants have been employed in traditional medicine.[1] Based on several medical systems like Ayurveda, Unani, and Siddha, India has amassed a wealth of information about medicinal plants over many years.[2] Traditional medicine has been supported in recent decades by the bioactive components found in medicinal plants, which have been the subject of several pharmaceutical investigations. Drug development in

developing nations is facilitated by possible sources of novel medicinal components. Around 85% of the world's population relies on an outdated primary healthcare system. According to Santosh *et al*. 2013, plants can synthesize new therapeutic components that improve human health and wellbeing.

According to reports, traditional healers in India use 2500 different plant species, and 100 of those plant species are used regularly as sources of medication.[3] The study of medicinal plants and their traditional use throughout the world has seen an increase in attention over the past few decades.[4] Additionally, due to the cost-effectiveness, safety, and efficacy of herbal treatments over synthetic drugs, herbal therapies are once again becoming popular as more people shift their attention from conventional pharmaceuticals to complementary herbal systems, also known as alternative medicine.

According to M.N. Diris *et al*. 2017.[5] *Melastoma malabathricum (L.*) is a monoecious flowering plant species that is a member of the enormous angiosperm family melastomataceae. Generally, *M. malabathricum* is a tiny shrub that is typically found in waste areas, roadside, and previously cleared ground throughout Southeast Asian nations, including Malaysia.[6] The plant is especially prevalent throughout Malaysia in lowland and highland forests, mostly in open areas. One of the most pervasive weeds is *Melastoma malabathricum*, which is found throughout South and South-East Asia. All across the tropics, especially in moist settings, it grows quickly and abundantly.[7]

There are three types of the plant *Melastoma malabathricum*.

I. The first variation is made up of big, dark purple-magenta flowers.
II. The second variant consists of medium-sized flowers with petals that are light pink-magenta.
III. The third type is an uncommon variant that consists of little white flowers.

Over the years, various tannins have been isolated from these cultivars. For instance, the plant with pale pink to magenta blossoms has the following compounds in its dry leaves: malabathrins B, C, D, and G, as well as casuarictin and pedunculagin.[8] *Malabathricum*, which has petals that have a light pink-magenta colour, also includes rutin, quercetin, quercitrin, -sitosterol, and –amyrin.[9]

TAXONOMY

Kingdom: Plantae

Clade: Angiosperms

Order: Myrtales

Family: Melastomataceae

Genus: Melastoma

Species: *M. malabathricum*

Binomial name: *Melastomamalabathricum L.*

(Source: https://en.wikipedia.org/wiki/ *Melastoma_malabathricum*)

MONOGRAPH

The native names given to this plant by various tribes and nations around the world vary. Some of its vernacular names are given below.

Table 1: Vernacular name.

SL.NO.	VERNACULAR NAME	TRIBE	COUNTRY	REFERENCE
1.	Futukola	Assamese	India	Roshan Sarmah *et al*[10]
2.	Ye mu dan	Chinese	China	Zhengyi *et al*.[11]
3.	Senduduk, sekeduduk, kenduduk	Malay	Malaysia	Abdul Majid *et al*.[12] Fazlin *et al*.[13]
4.	Mang kre, Mang re, Bre, Kadu-da	Thais	Thailand	Fazlin *et al*.[13]
5.	Kakkhu	Garo tribe	Bangladesh	Rahmatullah *et al*.[14]
6.	Yachubi	Meitei tribe (Manipur)	India	Khumbongmayum *et al*.[15]

MORPHOLOGY

Melastoma malabathricum L., is a relatively common herb or shrub that grows as small trees up to 20 feet tall in damp regions across the tropics. They may be discovered in the forest along a stream, on landslides, or in previous clearings. And they bloom all year long, being evergreen.[16] On the *M. malabathricum* plant, a comparatively straight tap root system develops together with several smaller emergent roots. It has a light to dark brown hue at the root. Small bristles, hairs, and rough, tiny scales coat the reddish-colored stems. The stems might be forked or subterete in character. Numerous, procumbent, and highly scaled branchlets are present. Simple, hairy, lance-shaped, and practically smooth on the margin, *M. malabathricum* leaves have a few basic characteristics. The base and tip of the leaf are sharply formed. Up to 3.5 cm wide and 14 cm long is the maximum size of the leaf. The

hairy, reddish, leaf petiole, measuring 1 to 1.5 cm long, is hairy. Compared to its lower surface, which is a lighter green, the leaf's top surface has a little to noticeably darker green colour. The bloom is pedicellate, epigynous, medium in size, and has five to six bracts at the base that resemble pale leaves. On each flower, there are five to six round, reddish-purple petals. The lanceolate to ovate calyx lobes with silvery scale covering them and an acuminate apex. A thick layer of scales with a light hue covers the ovary and pedical. The flowers, which only last one to two days, are grouped together in groups of five to ten. *M. malabathricum* produces edible berries as its fruit. while ripe, the irregularly shaped fruits that are creamy white while immature, split open to reveal the soft, dark purple pulp and numerous seeds. Fruit has a comparatively sweet flavour.[17]

Fig-1

Fig-2

ETHNOMEDICINAL USE

Numerous folk medical applications for *M. malabathricum* have been described, but they are not supported by clinical evidence.[18,19] It has been used in traditional medicine to treat piles, diabetes, high blood pressure, diabetes-related scarring, diarrhoea, and wounds that are healing too slowly.[20,21] Reportedly Sharma *et al*. claim that the leaves can be used as a tonic, to cure piles, diarrhoea, and other gastrointestinal disorders, as well as to prevent smallpox scarring. The juice from the shoots can also be used as a mouthwash to cure leukorrhea and ease toothaches, while the shoots themselves can be consumed to treat diabetes, high blood pressure, and puerperal infections.[18,16] According to Mohandoss and Ravindran 1993**,** flower of the *Melastoma malabathricum* are used to treat cancer.

Table 2 outline the various traditional use of the plant *M. malabathricum* by various communities or tribes all around the world. The therapeutic qualities of this plant and its phytochemical components have been examined jointly in the current review to offer some scientific support for its use as a folk remedy.

Table 2: Traditional use.

SL.NO	COMMUNITY /TRIBE	COUNTRY	MEDICINAL USE	REFERENCE
1	Naga	Manipur, India	Fever, stomach problems, and cuts and wounds are all treated with the fresh and dried leaves.	Ringmichon *et al.*[23]
2	Meitei		Skin issues, leukorrhea, diarrhea, and dysentery are all treated using the bark and leaves.	Thatoi *et al.*[24]
3	Garo	Netrakona, Bangaldesh	The leaf juice is used to treat various urinary issues and as a diuretic.	Rahmatullah *et al.*[25]
4	Marmas	Bandarban, Bangladesh	To treat jaundice, the root juice is used.	Rahmatullah *et al.*[26]
5	Malay	Malaysia.	Dry lips are treated with fruit juice. To hasten the healing of wounds, the crushed leaves are administered.	Ong and Nordiana.[27] Ong and Nordiana.[28]
6	Sundanese	Indonesia	The leaves are applied topically or consumed orally to cure toothaches and as a postpartum treatment.	Roosita *et al.*[29]
7	Talang Mamak		Cuts and wounds are treated using a compress made of the pulverized leaves.	Grosvenor *et al.*[30]

PHYTOCHEMISTRY

According to various studies the plant *Melastoma malabathricum* contain variety of phytochemical constituents such as, according to Ali *et al*., 2010, 90% aqueous methanolic extract of leaves contain Ursolic acid, 2-Hydroxyursolic acid, Glycerol 1,2-dilinolenyl-3- O-(4,6-O-isopropylidene)-β-D-galactopyranoside. A flavonoid glycoside called isoquercitrin 6-0-gallate, three novel dimeric hydrolyzable tannins called malabathrins B, C, and D, and the isolation of these compounds were all reported by Yoshida *et al*.

A list of phytochemical constituents derived from different parts of *M. malabathricum* with various solvents are given in the Table-3.

Table-3.

SL.NO.	PLANT PART	SOLVENT	COMPOUND NAME	REFERENCE
1	Leaves	Methanol	Glycerol 1,2-dilinolenyl-3-O-(4,6-di-O- isopropylidene)- β-D-galactopyranoside	Nurestri *et al*.[33]
			Rutin A	Nazlina *et al*.[34]
			QuercitrinA	Susanti *et al*.[35]
		70% acetone	Malabathrin D	Yoshida *et al*.[36]
			StrictininA	
			Casuarictin	
			Pterocarinin C	
			Nobotanin B, D, J, H	
2	Roots	ethanol	β-Sitosterol	Manzoor-I-Khuda *et al*.[37]
3	Barks	methanol	Ellagic acid	Lowry.[38]
4	Flower	methanol	Kaempferol-3-O-(2'',6''- di-O-p-trans-coumaroyl)- β-glucoside	Koay.[39]
5	Stems	n-Hexane	α-Amyrin	Koay.[40]

PHARMACOLOGICAL ACTION

As describe earlier various parts of the *M malabathricum* has been used for treatment of different diseases, which are particularly supported traditional medicine system of East-Asian countries. In recent years various research has been reported that various parts of the plant *M. malabathricum* possesses antibacterial, antiviral, antiparasitic, antioxidant, cytotoxic, anticoagulant, platelet-activating and antipyretic properties at various doses/concentrations.

1. Antimicrobial activity

The antibacterial activity of methanol extracts against *Pseudomonas aeruginosa*, and *Staphylococcus aureus* was discovered by M.N. Diris *et al*. in 2017. They studied the phytochemical constituent in methanolic leaf extract of *M. malabathricum* and their antimicrobial activity.

Maji *et al*. (2010), investigated the antimicrobial effectiveness of WMML, AcMML, and benzene (BMML) extracts of *M. malabathricum* leaves against B. cereus, C. albicans, K. pneumoniae, E. coli, S. aureus, and V. cholerae using the agar well diffusion method with Ciprofloxacin (50 g/mL) as the standard antibiotic. While the MIC values for the WMML and AcMML against S. aureus (MDR) were 0.80 and 0.79, respectively, for the BMML,

AcMML, and WMML against V. cholerae, respectively, they were 0.65, 0.80, and 0.80 mg/mL. Only the AcMML yielded MIC value, which was recorded at 0.80, 0.80, 0.79, and 0.62 mg/mL, respectively, for E. coli (MDR), K. pneumoniae, C. albicans, and B. cereus.

According to the MBC value, the two *M. malabathricum* extracts—AcMML and BMML—exerted bactericidal effects against S. aureus (MDR) at a concentration of 1.00 mg/mL while the three *M. malabathricum* extracts displayed bactericidal activity against V. cholera at a dosage of 0.90 mg/mL.

The antiviral activity of MMML has been researched by Nazlina *et al*. The antiviral activity was tested against HSV-1 and the Schwartz measles vaccination strain. It was discovered that the extract had no prophylactic impact on either of the test viruses, as shown in the treatment mode ((C + E) + V). In this study, it was discovered that guanidine hydrochloride, used as a control, inhibited the capacity of viruses to infect host cells when given simultaneously. This effect is thought to be caused by preventing the viral RNA synthesis beginning step.

The ethnomedicinal usage of *M. malabathricum's* leaves as an antibiotic agent against several different infections has been demonstrated, and they may have great antibacterial potential**.**

2. Antioxidant activity

According to Faravani, the DPPH assay was used to test the antioxidant activity of crude MMMR and methanol extracts of *M. malabathricum* shoots (MMMSt). The MMMSt demonstrated their extreme scavenging behavior. As demonstrated by their capacity to scavenge the stable free-radical DPPH and convert it to the yellow diphenyl-picrylhydrazine, with IC50 values of 141.9 g/mL and 154.5 g/mL, respectively. The antioxidant activity of the extract was thought to be less potent than that of the ascorbic acid used as the positive control, which had an IC50 of about 28.6 g/mL.

The antioxidant properties of the crude forms of EAMMFw and MMMFw in ethanolic solution have also been investigated by Susanti *et al*. Using vitamin E and vitamin C as the usual positive controls, the antioxidant assay was performed using the DPPH radical scavenging electron spin resonance (ESR) spectroscopic method. The MMMFw exerted a greater free radical scavenger activity than the EAMMFw at a concentration of 7.8 g/mL for the DPPH assay, with the percentage of inhibition measured at 59.3 1.4% and 53.2 1.3%,

respectively. In the MMMFw, kaempferol-3-O-(2,6-di-O-p-trans-coumaroyl)-glucopyranoside and kaempferol-3-O-D-glucoside were present, which was the cause of this. By employing the DPPH test and the Superoxide anion radical scavenging assay, Z.A. Zakaria also investigates the antioxidant activities of the methanolic and aqueous extract of Melastoma malabathricum. M. malabathricum's 500 g/ml aqueous and methanol extracts were the only ones to exhibit significant 2,2-diphenyl-1-picrylhydrazyl radical scavenging action. The aqueous and methanol extracts of *M malabathricum* demonstrated high antioxidant activity for the superoxide scavenging assay.

3. Anti-inflammatory activity

The use of botanical and herbal remedies as a supplemental strategy for the treatment of inflammatory illnesses has been progressively rising, probably as a result of the negative effects connected with the use of nonsteroidal anti-inflammatory pharmaceuticals. *Melastoma malabathricum*, according to research by M.P. Mazura *et al*., has anti-inflammatory properties thanks to the presence of α-amyrin, betulinic acid, quercetin, and quercitrin. It seems that α-amyrin and betulinic acid had significant inhibitory effects of 67.3 and 64.3%, respectively, in the platelet activating factor inhibitory binding experiment. With inhibitory percentages of 57.4 and 45.4%, the other two substances, quercetin and quercitrin, seemed to exhibit modest inhibitory efficacy. The bioassay's positive control was cedrol, a well-known PAF antagonist derived from natural sources.

In a study on *M. malabathricum* leaves' aqueous extract by Z. A. Zakaria, it was discovered that the herb has strong anti-inflammatory benefits when used to produce paw edoema using carrageenan. This study provided scientific confirmation of the traditional usage of *M. malabathricum* leaves to treat inflamed lesions.

Using a mouse ear oedema experiment caused by 12-O-tetradecanoylphorbol-13-acetate (TPA), Susanti *et al*. also looked into the anti-inflammatory efficacy of isolated molecules derived from HMML, EAMML, and MMML. As compared to indomethacin, which has an IC50 of 0.5 mg/mL (2.10 0.5 mM/ear), kaempferol-3-O- (2,6-di-O-p-trans-coumaroyl) glucoside and -amyrin showed the strongest anti-inflammatory activities in this assay. To compare with their pure constituents, no information was provided regarding the anti-inflammatory efficacy of those crude extracts.

CONCLUSION

Various traditional applications and biological functions of the plant *Melastoma malaathricum* have been attempted to be compiled in the current review. An extensive body of research on *M. malabathricum* has demonstrated that it is frequently utilized in traditional medicine across many tribes and nations. For instance, diarrhea, wound healing, toothaches, and dysentery. Its wide range of biological effects, including antibacterial, antioxidant, and anti-inflammatory, were proven by the pharmacological investigation. The pharmacological study's findings have supported the traditional medicine's efficacy. To comprehend its other beneficial qualities and their mode of action, more research is needed.

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